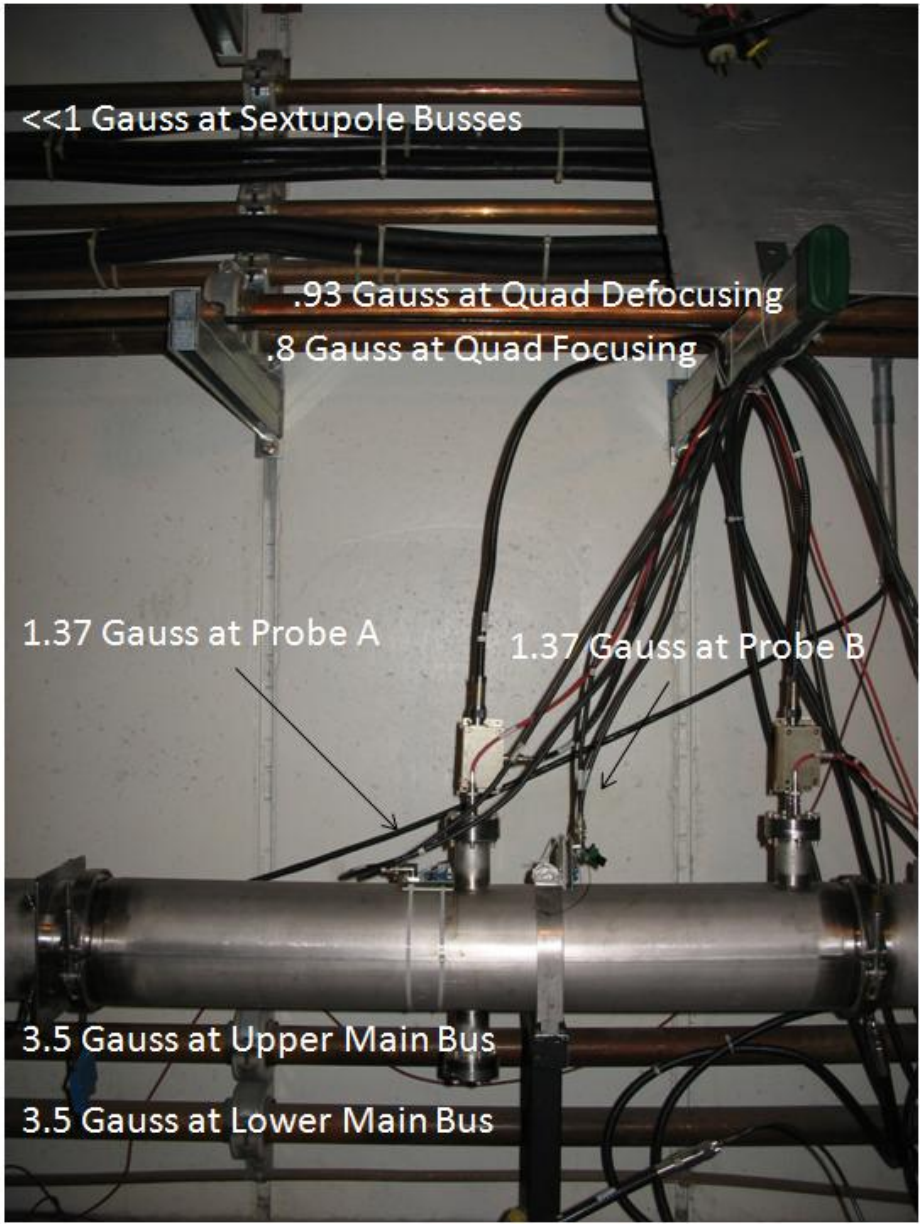
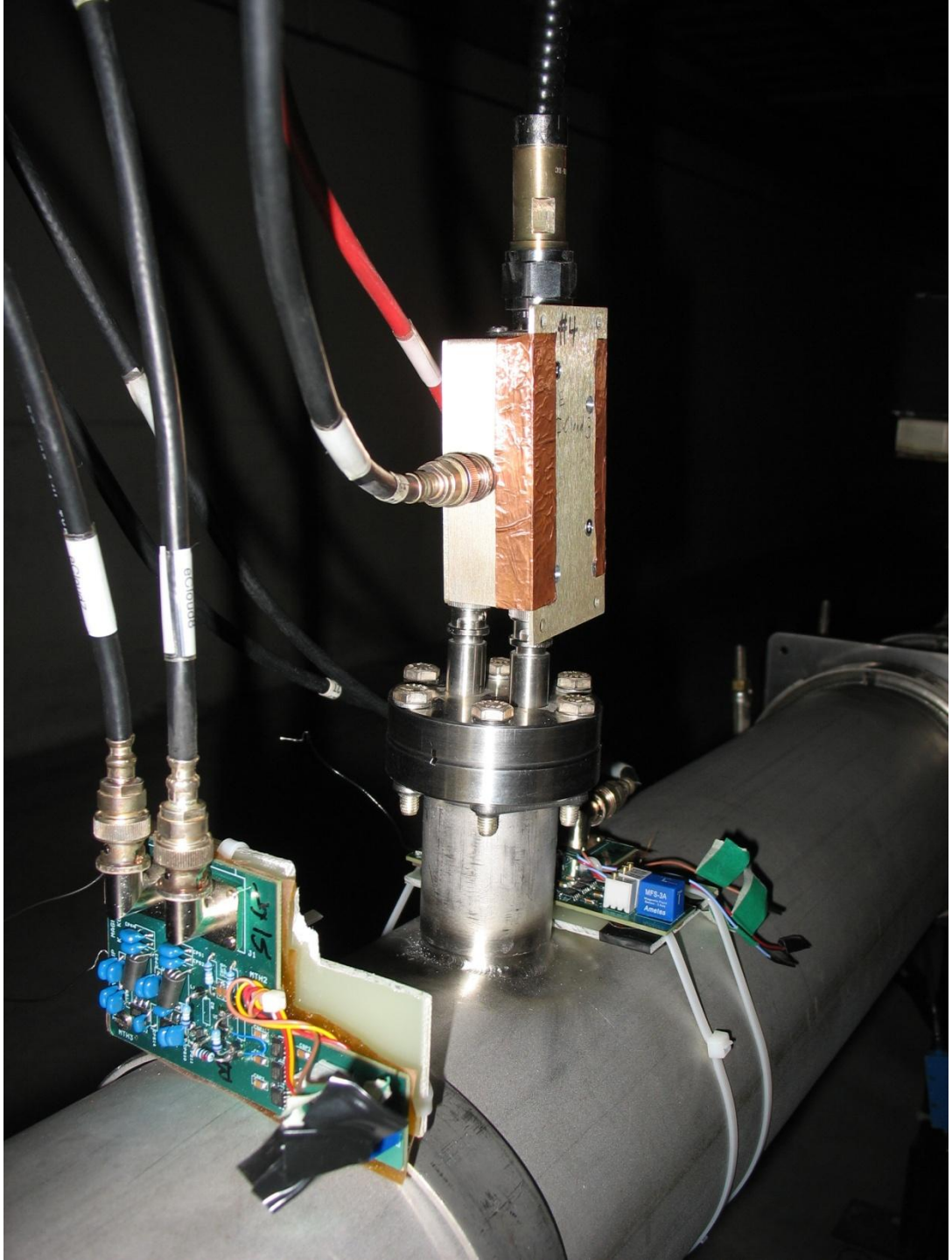
Initial Ecloud Measurements With Amorphous Carbon Coated Beam Pipe and Magnetic Field Measurements

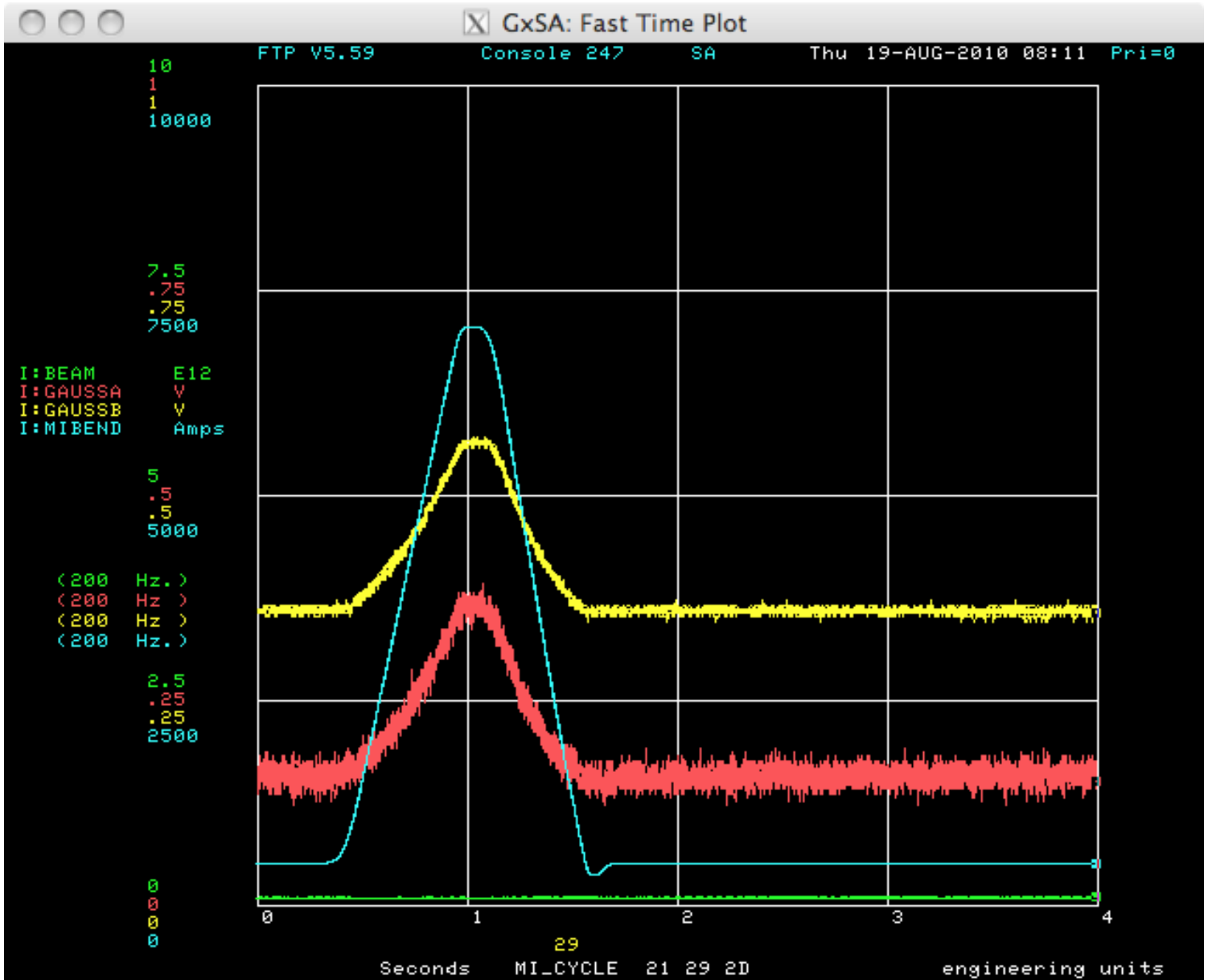
For Ecloud Working Group Meeting on Sept 2, 2010

Initial Magnetic Field Measurents

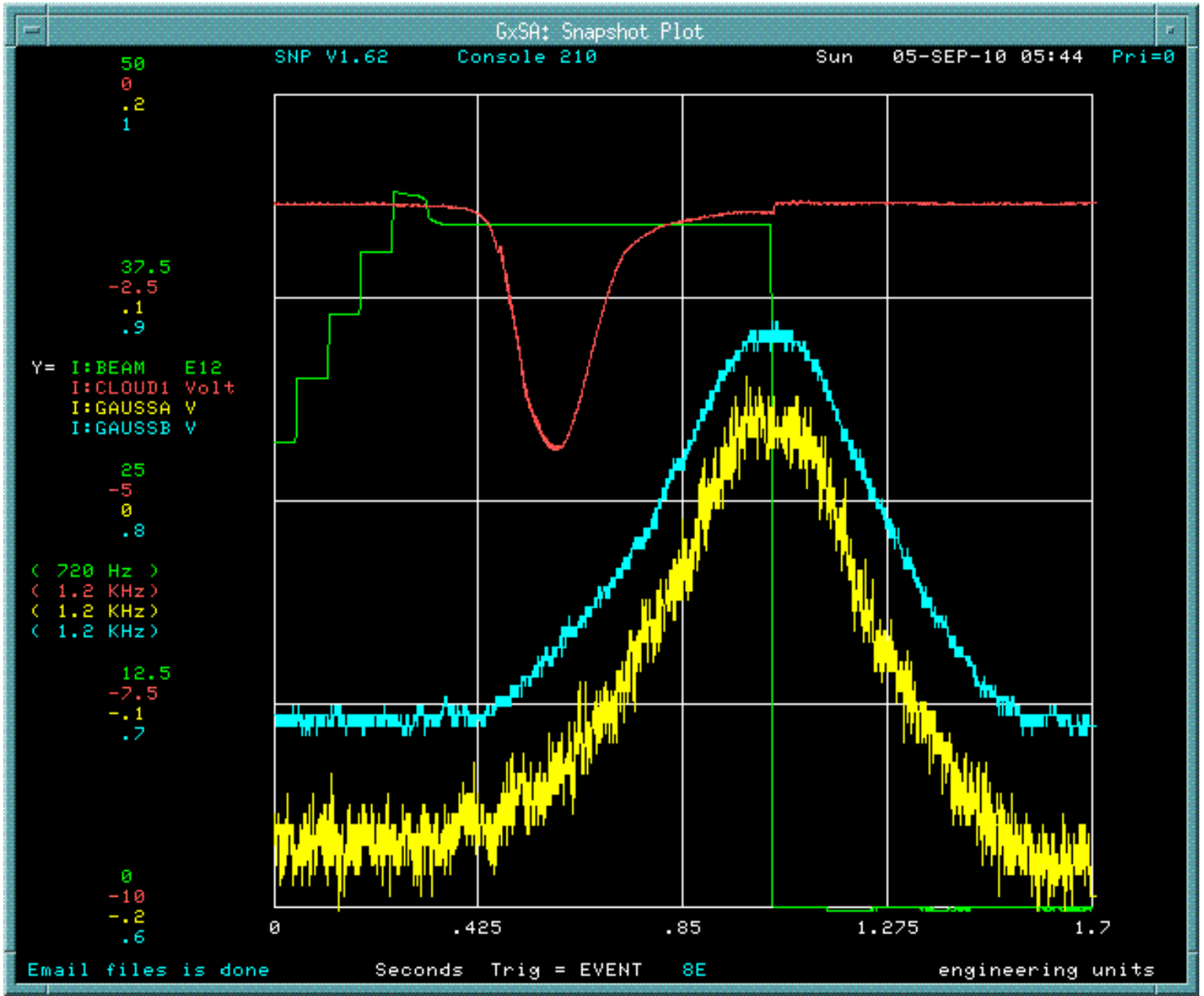



MF6-3A
Ametes

Magnetometers With MI Ramp



Magnetometer Signals Plotted with I:CLOUD1



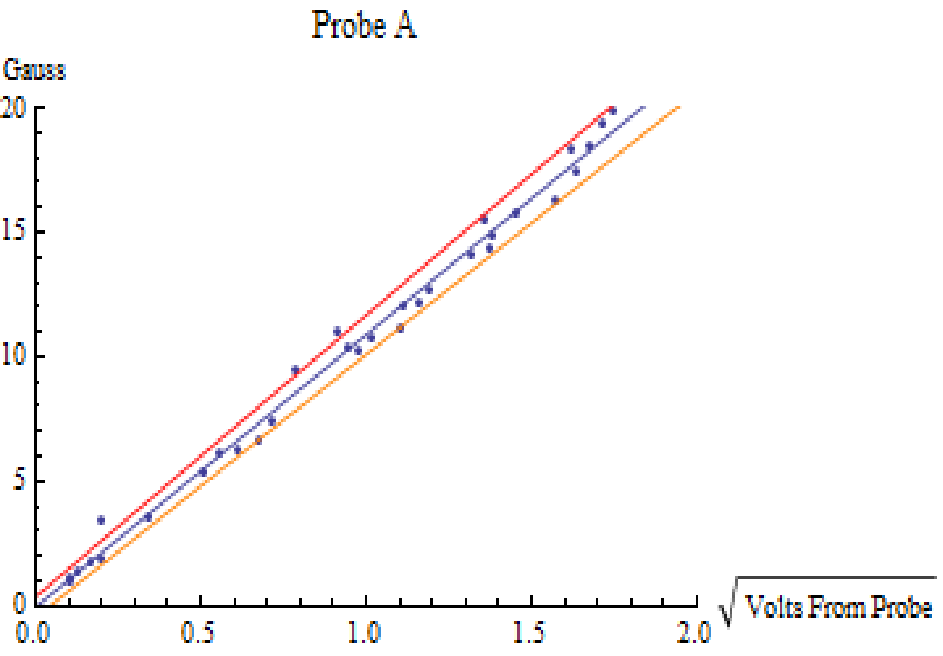
Magnetic Field Probes

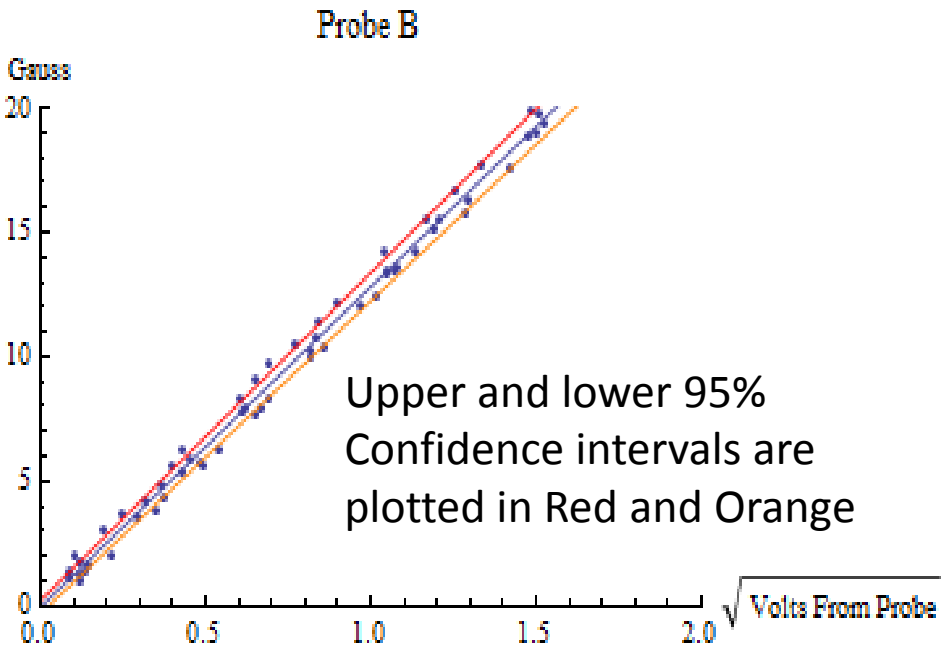
This data was taken using a helmholtz coil and a Lakeshore Hall Probe.

The measurements were taken in the lab with the field in all three directions and both polarities for each direction.

All tunnel measurements were found by taking the difference between the probe readback at the 8Gev ramp value and the 120 GeV ramp value.

We then take the square root of this value and plug this into one of our linear fits found from the lab data shown below.





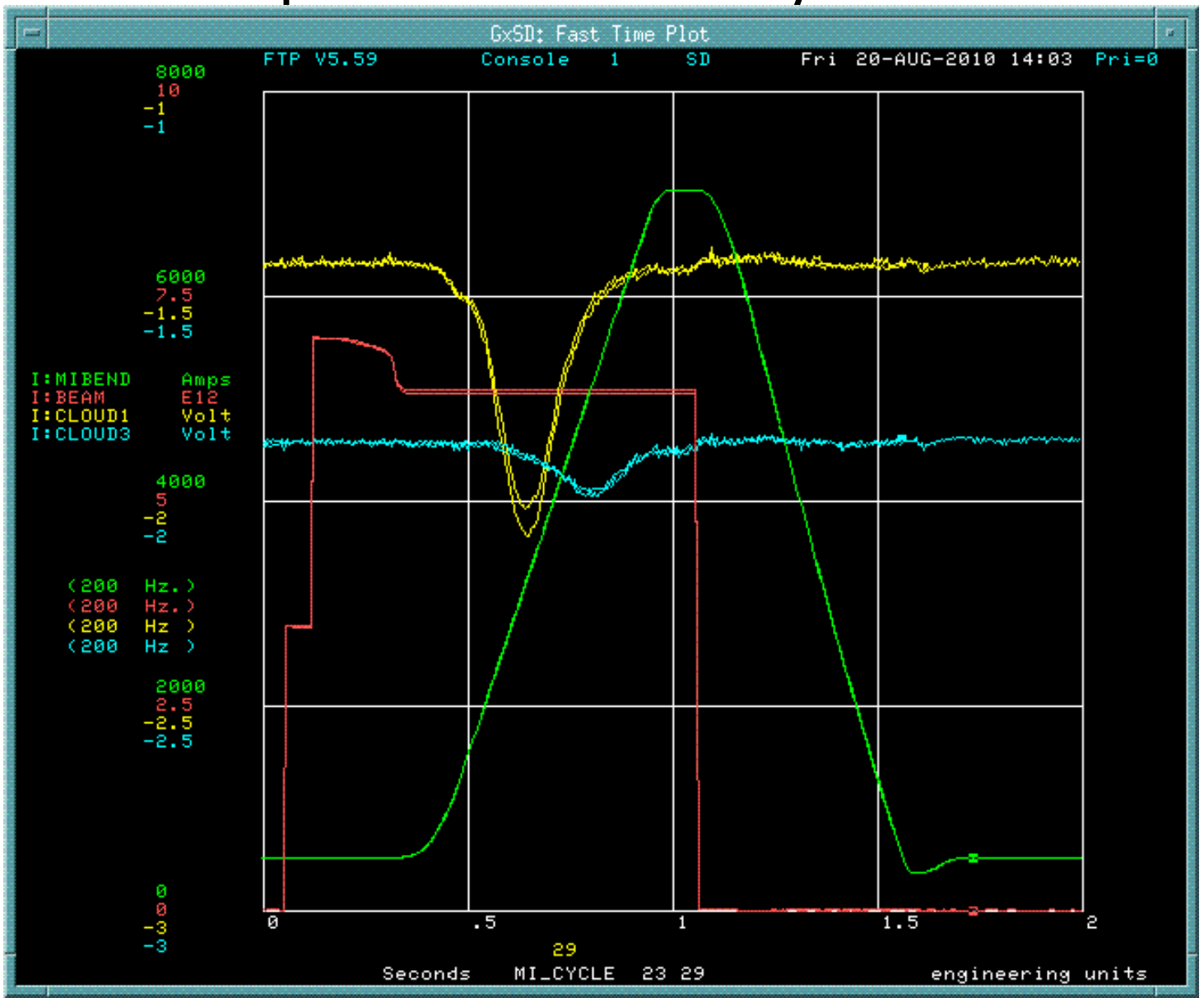
Maximum Magnetic Field

Probe A measured 4.9 Gauss at maximum with an upper 95% confidence interval Value of 5.5 Gauss and a lower value of 4.3 Gauss

Probe B measured 5.6 Gauss at maximum with an upper 95% confidence interval Value of 6.0 Gauss and a lower value of 5.2 Gauss

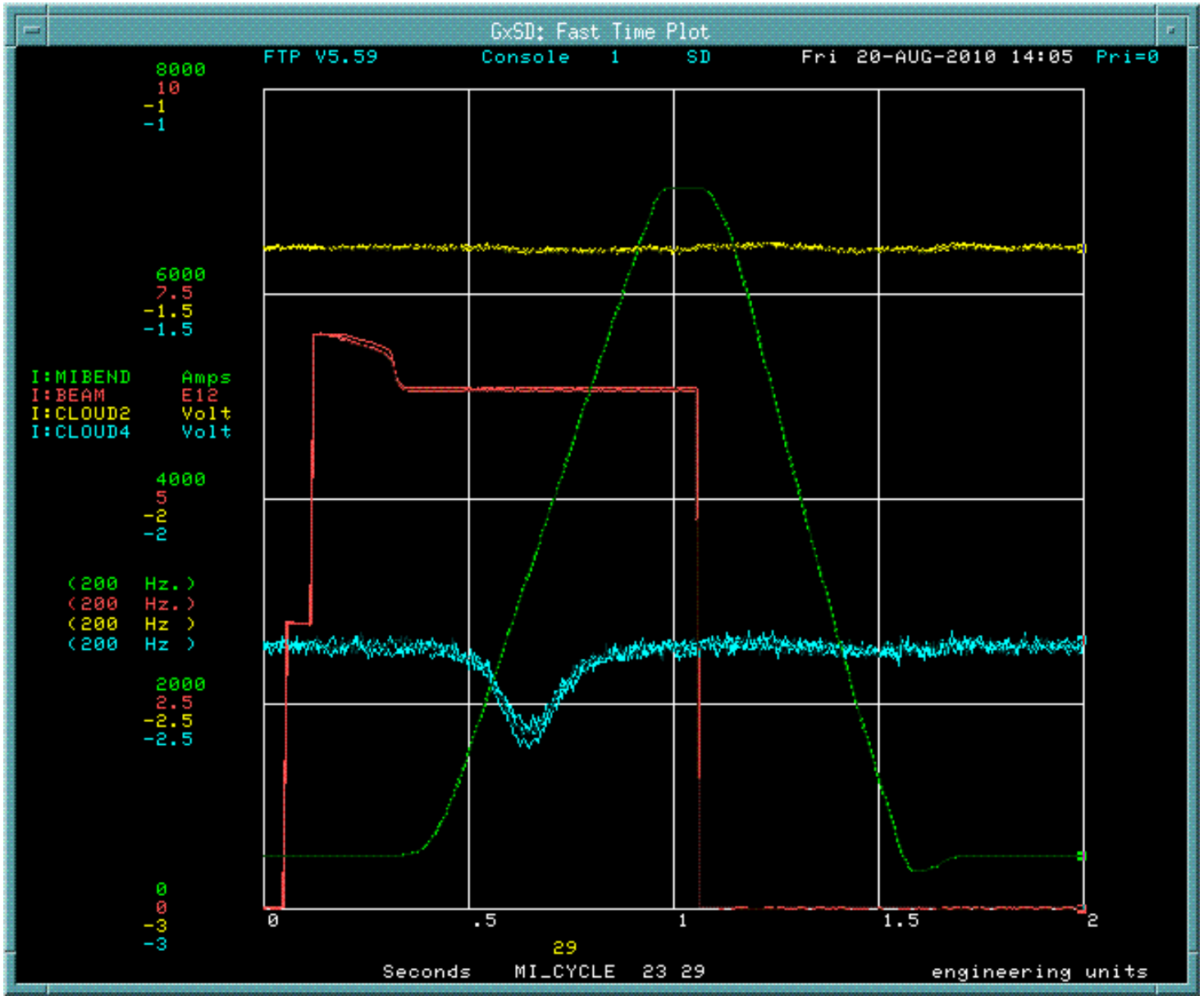
Initial Signals

Slipstacked Pbar only Beam



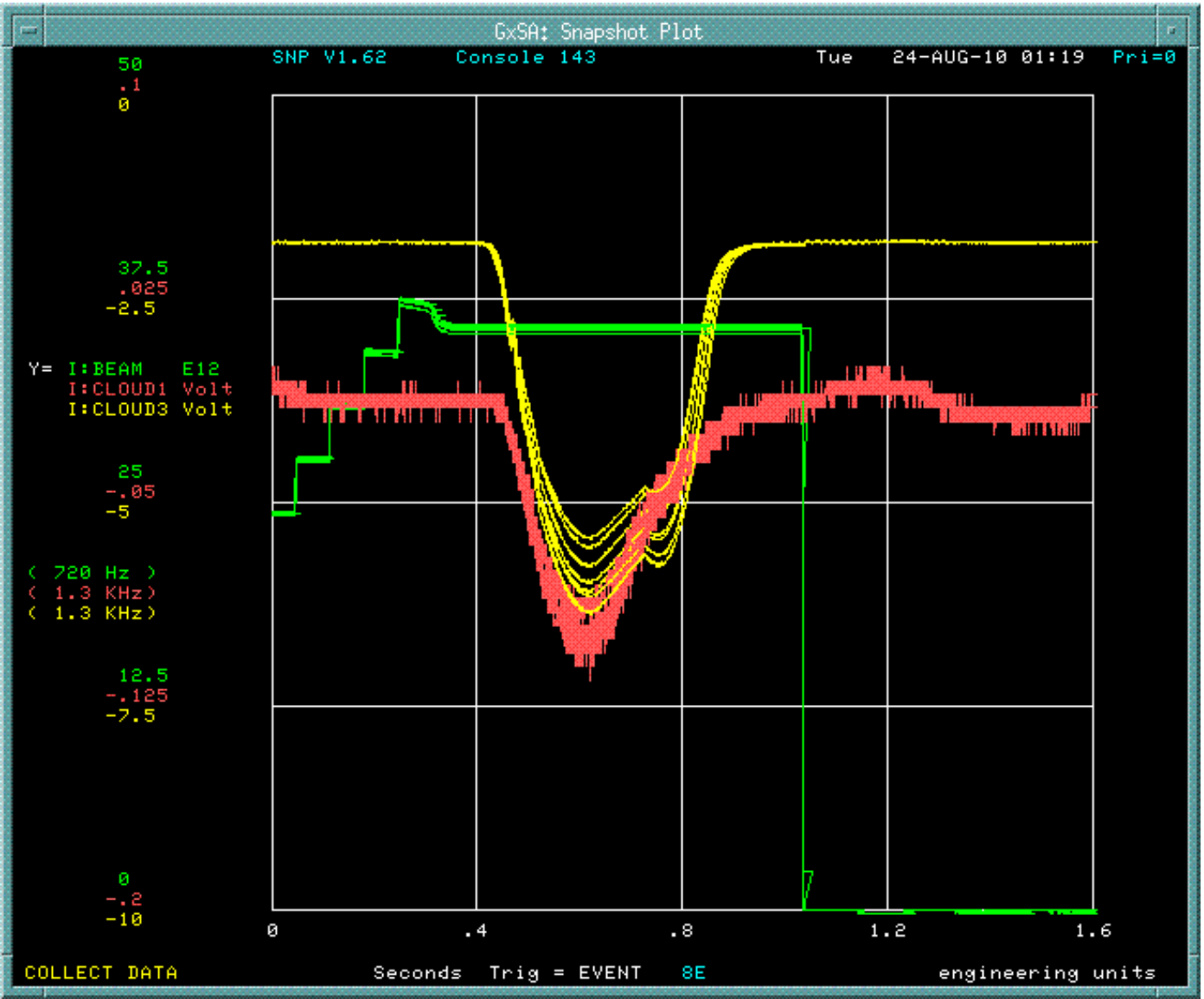
Initial Signals

At first I:CLOUD2 showed no signal



Double Hump

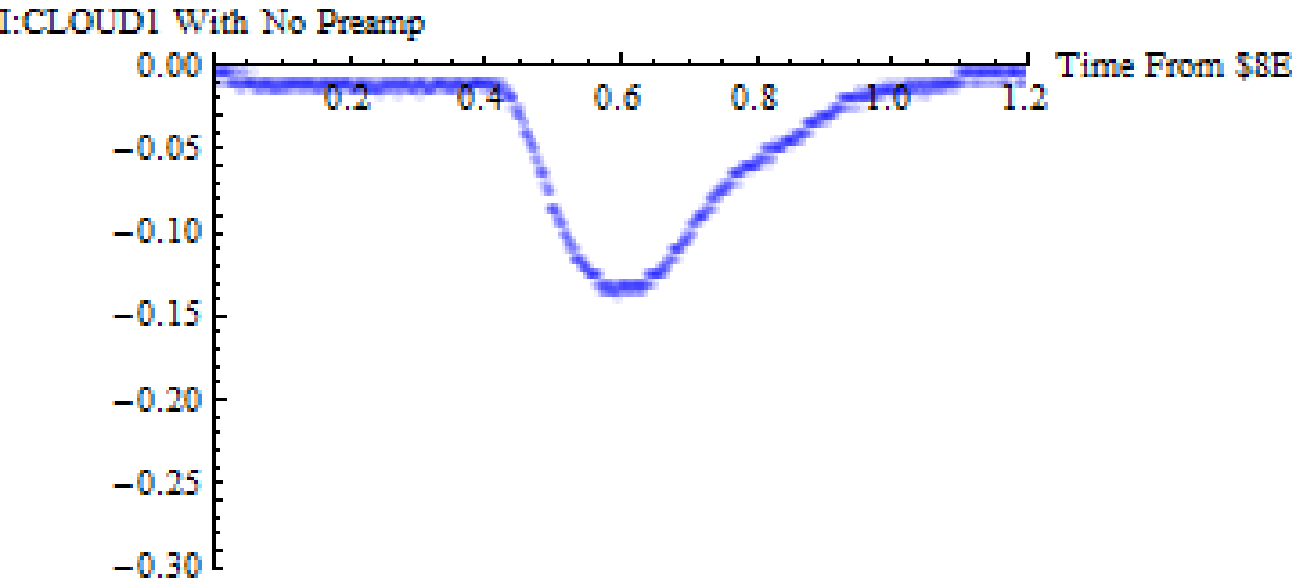
Appears on I:CLOUD3 when signals are strongest

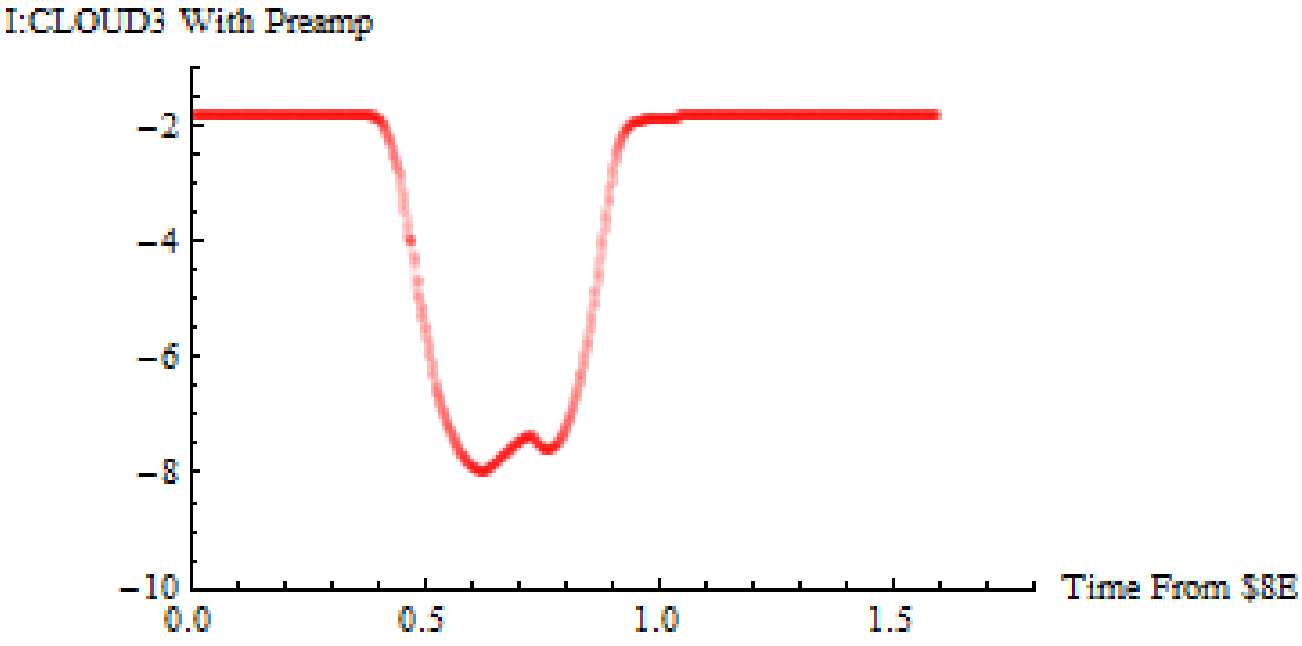


I:CLOUD1
With Preamp Off

Numi/Pbar Sipstacking

August 23, 2010

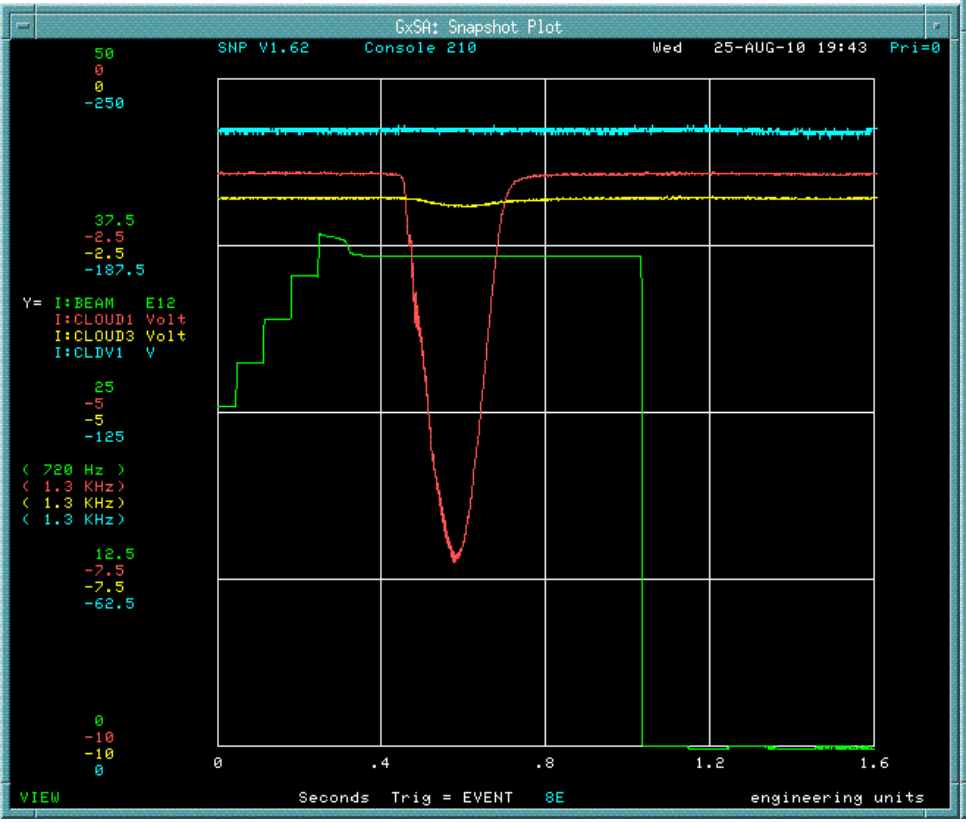


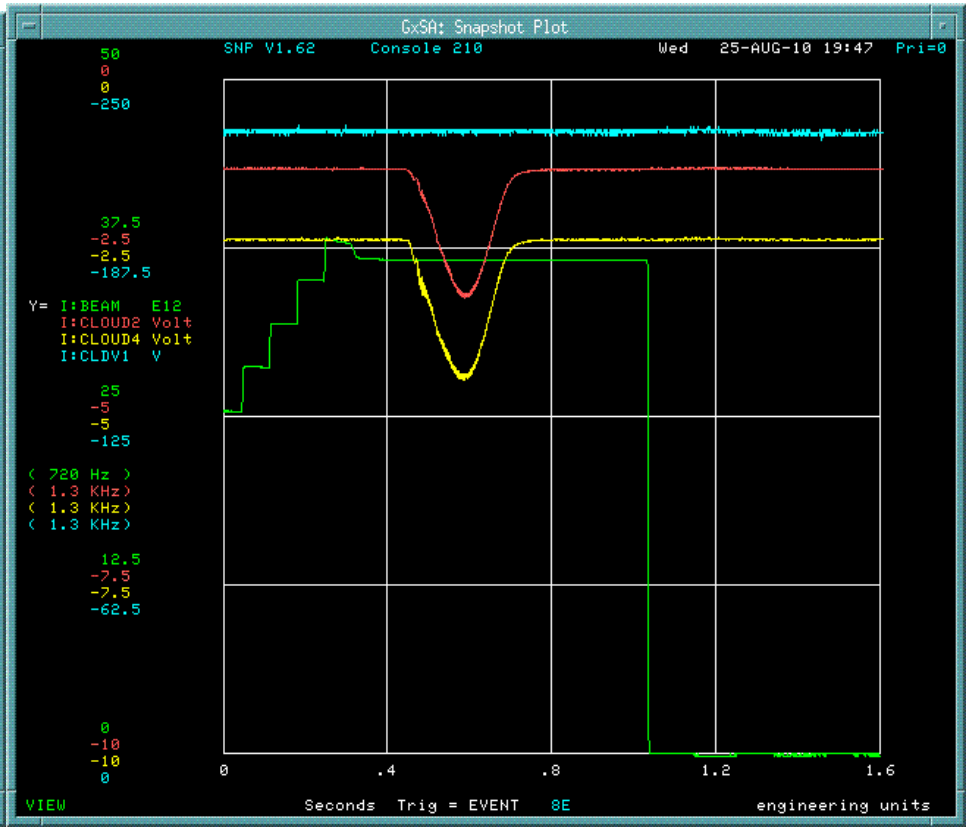


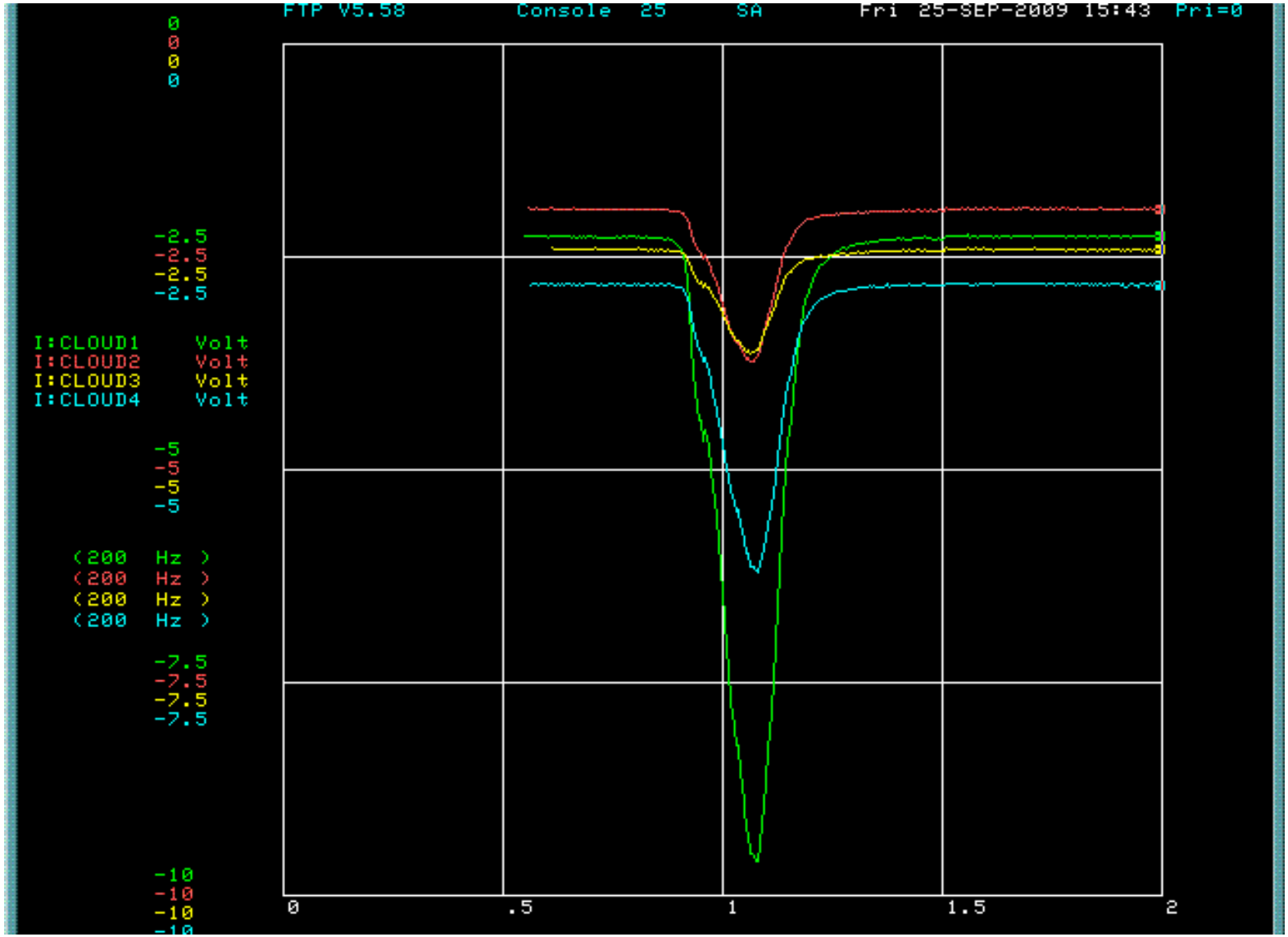
Comparison of all 4 Detectors

All preamps are on and the grid is set to -230 Volts (otherwise I:CLOUD1 and I:CLOUD4 signals distort)

8/25/2010

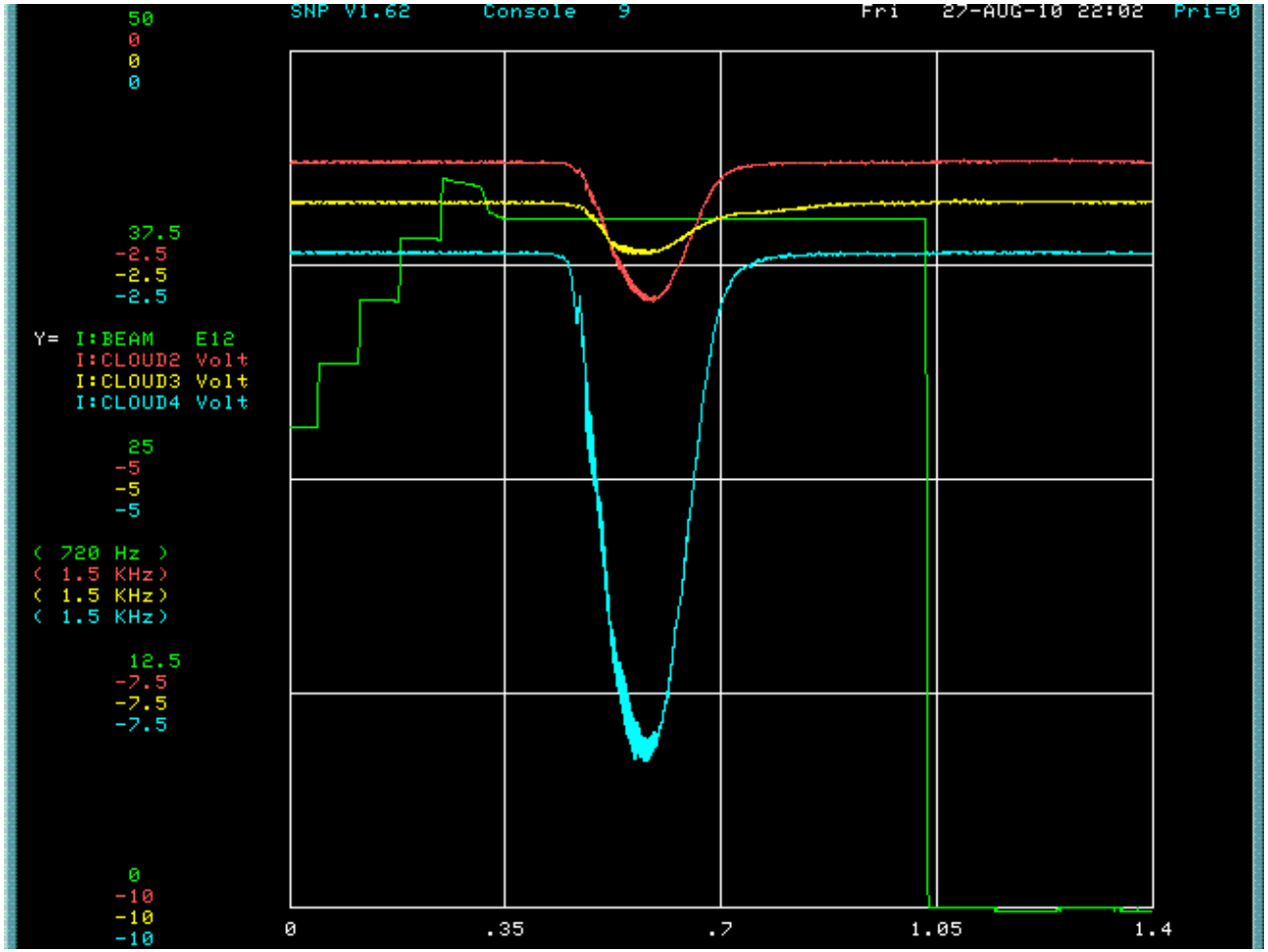






All RFAs with Preamps on and -20V on Grid with TiN lined Pipe

Sept 25 2009



I:CLOUD2, I:CLOUD3 and I:CLOUD4 with -20V on Grid and Preamps On

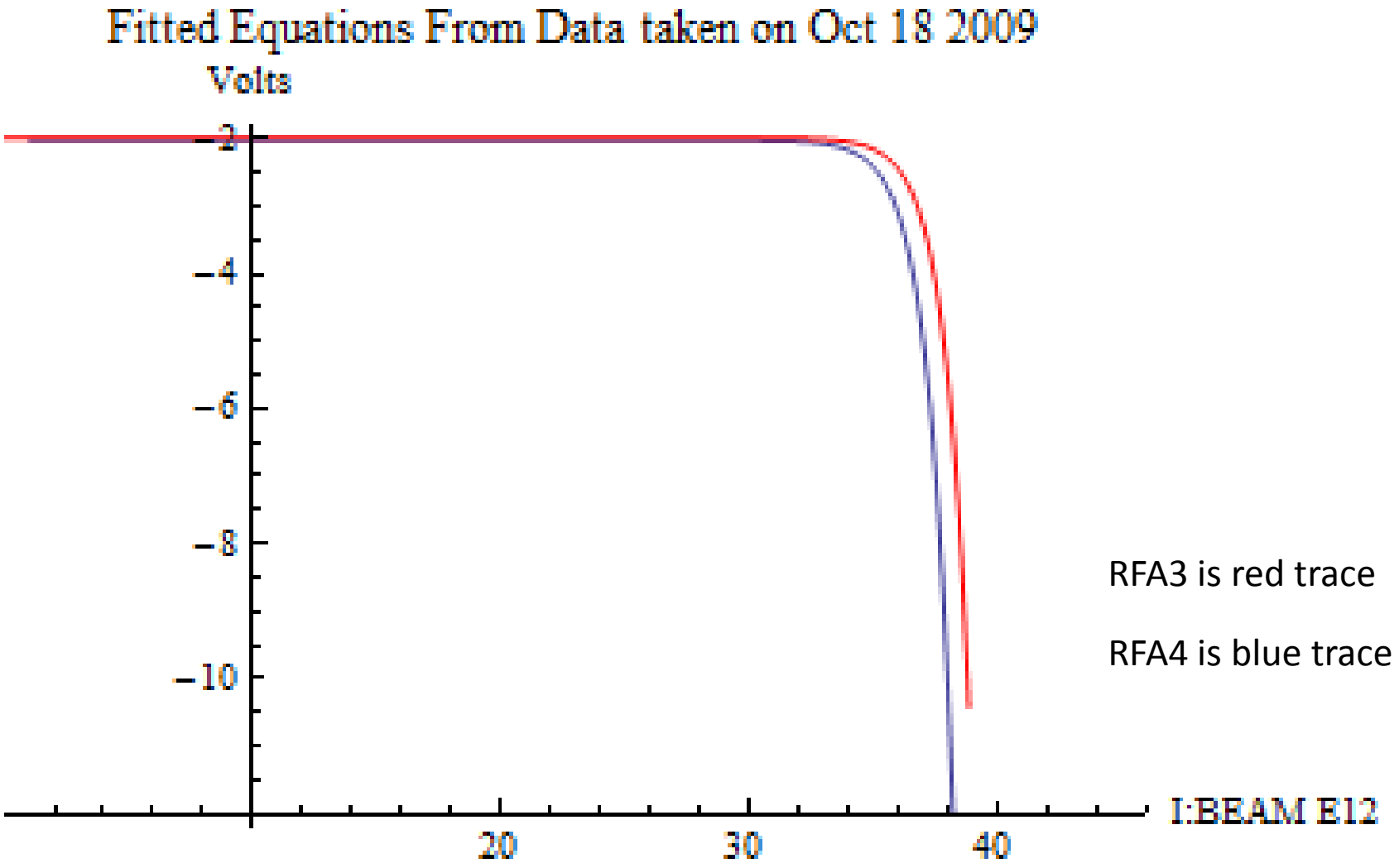
August 27, 2010

We can not compare a ratio of the size of individual pulses without understanding how MI intensities influence this ratio within the range of our detectors.

See plots on next page to illustrate this:

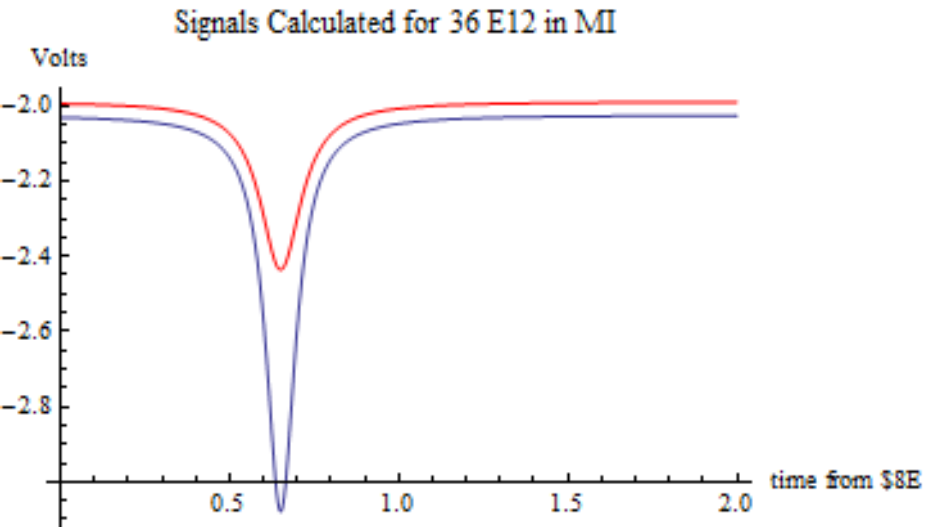
We Need To plot Signal strength versus I:BEAM

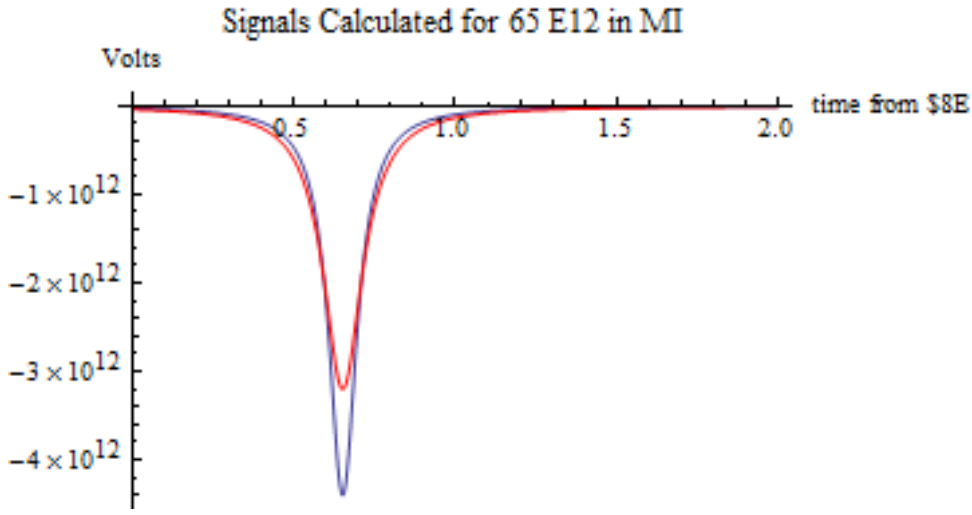
Using these two functions to represent the signal maxima we can find lorentzian functions for each detector based on different MI beam intensities



In this “extreme” case we evaluate for I:BEAM equal to both 36 E12 and 65 E12

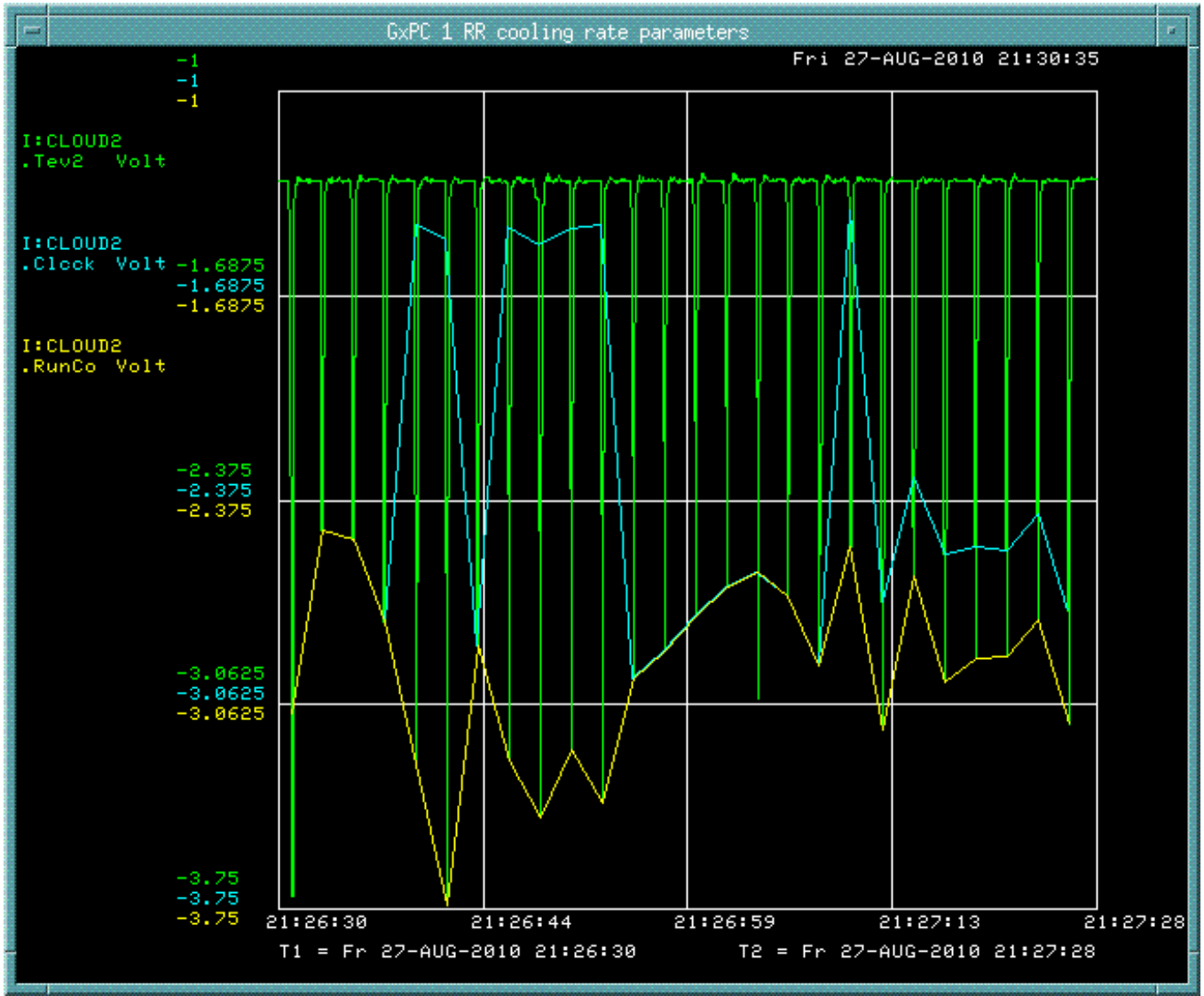
Note: The ratio of RFA3’s signal to RFA4’s signal is dependant upon I:BEAM



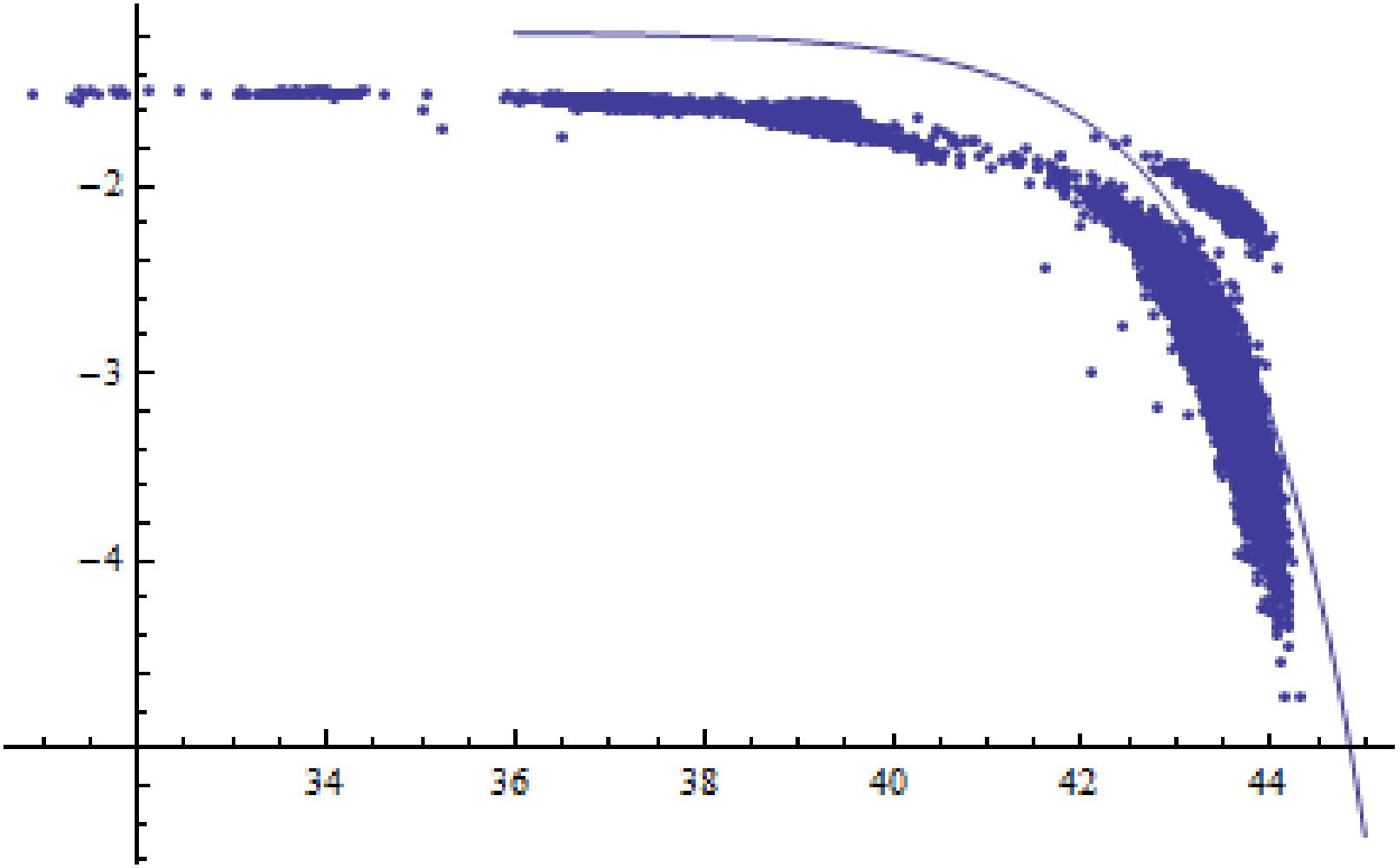


Timing Jitter Problems

The blue trace is plotted at 580 msec from the $8E. The green trace is plotted 618 msec from the 8E. There seems to be significantly greater error in the 580 msec datalogger which should be closer to Green maxima.

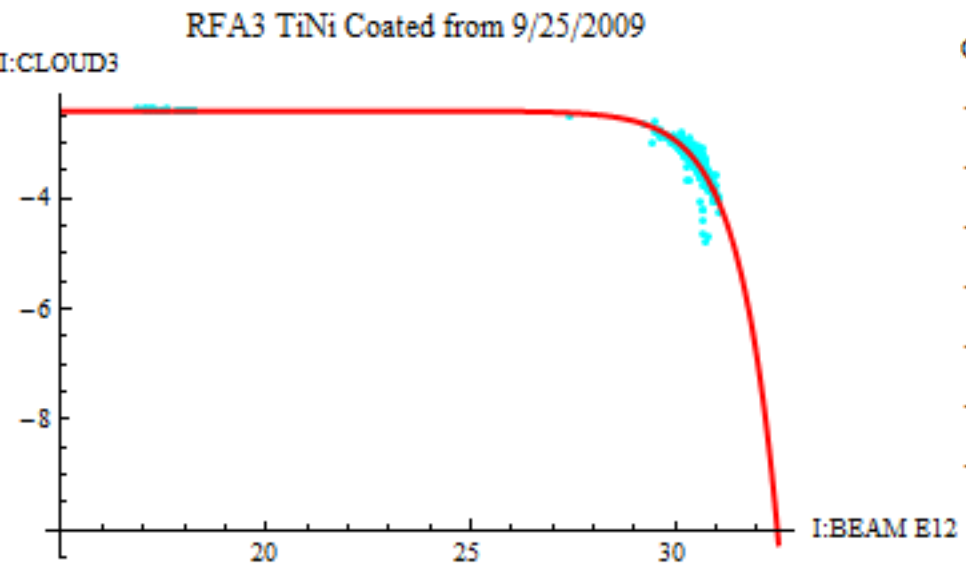


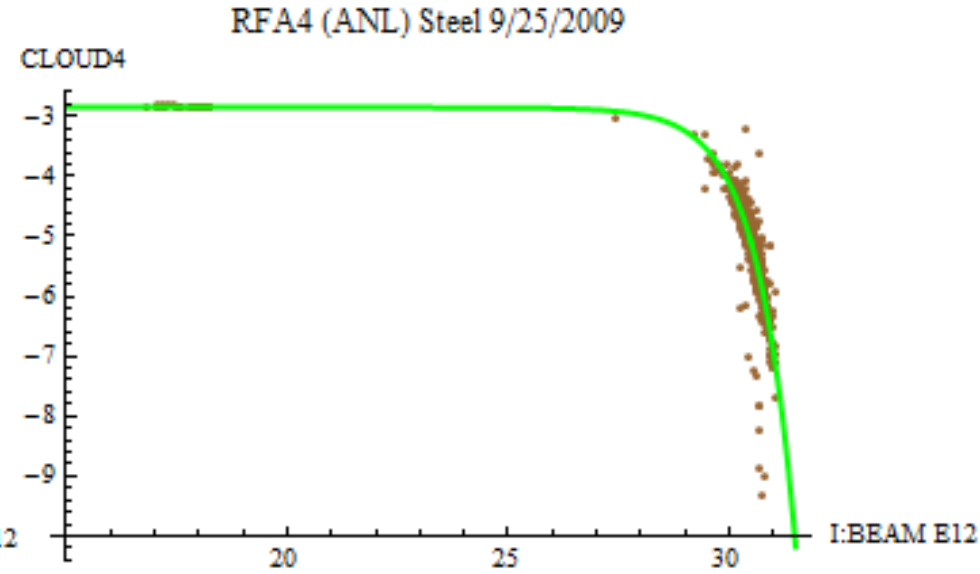
Since the Jitter Causes a Smaller signal than the max to be recorded, I throw away the data above the Arc seen or manipuate the fit to match the largest signal



Compare to TiN

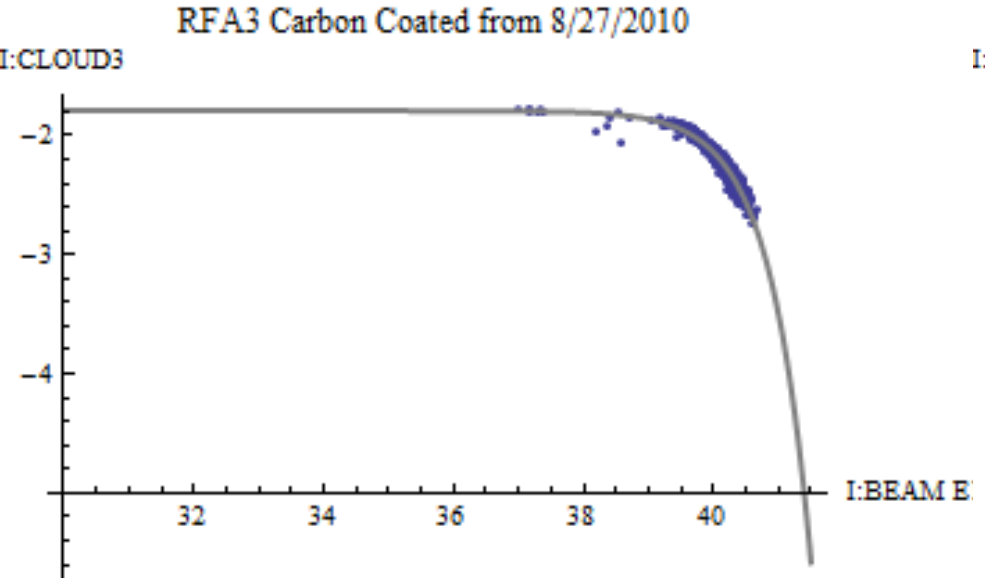
Since RFA1 was overdriven early in the run, we can compare RFA3 and RFA4 to this data taken in the last run

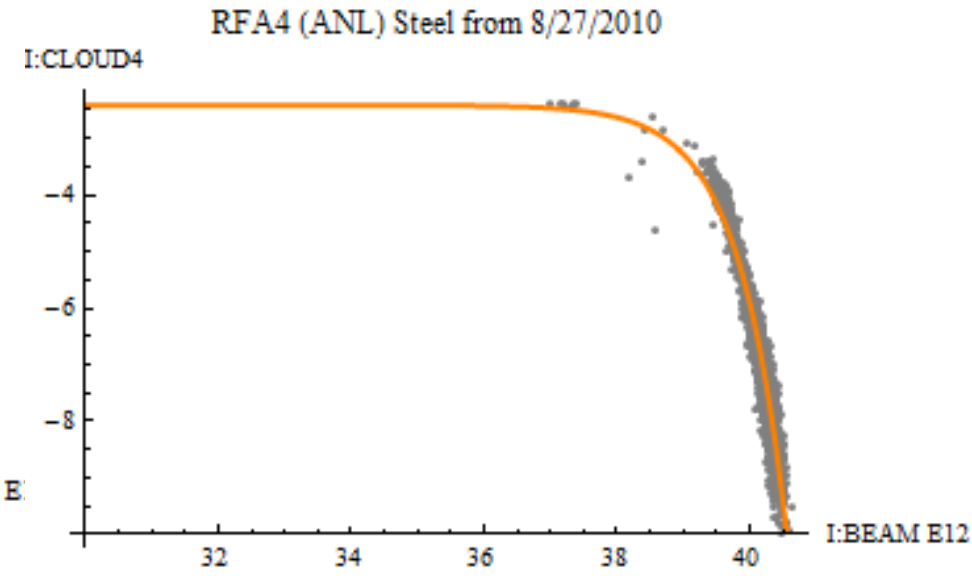


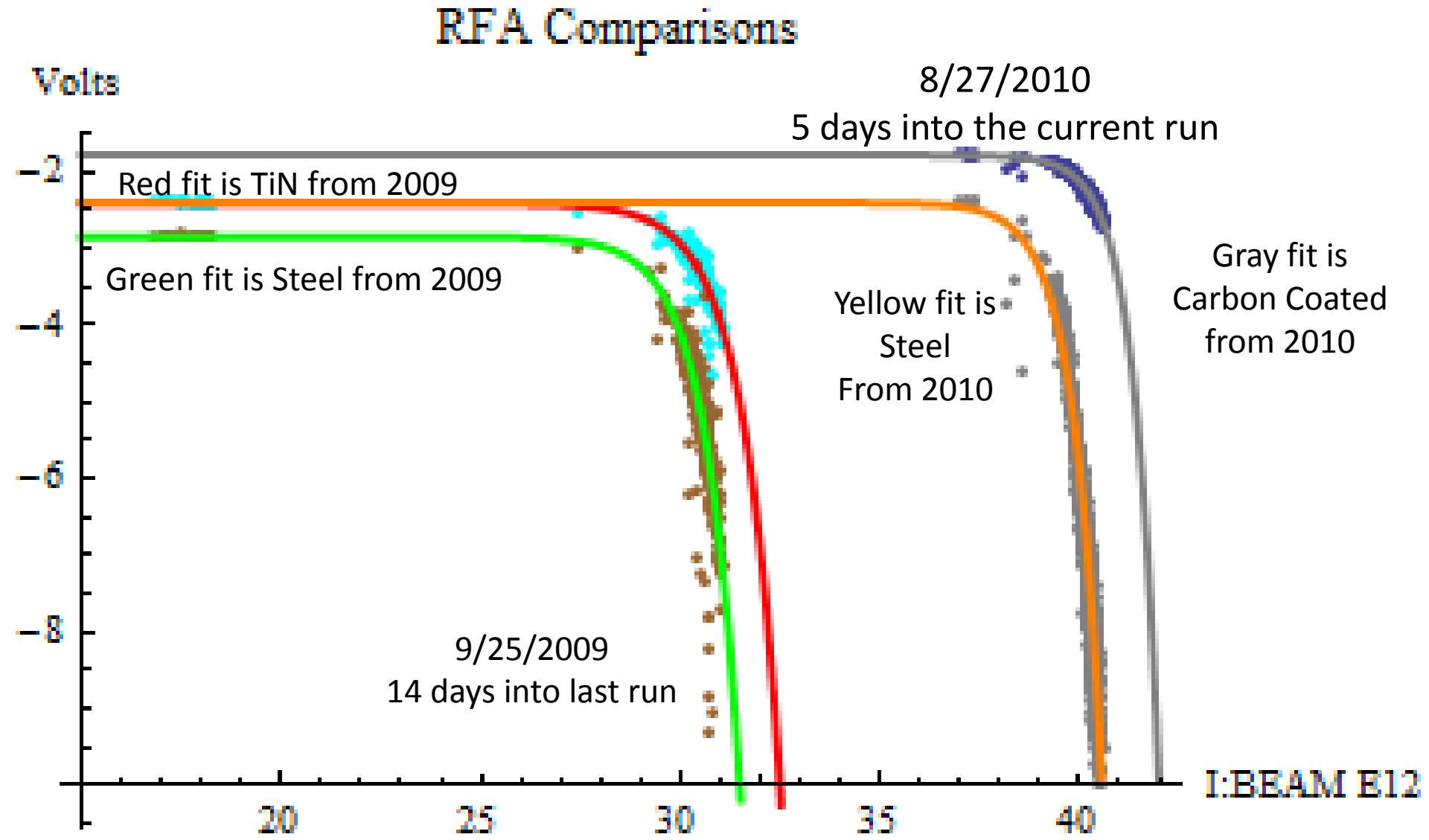


Note: This data was chosen because it is the first legitimate data of this type that we have. The last run started on 9/12/2009 thus this data is on the 14th day of the run.

These plots are from 5 days into the current run with Pbar/Numi Slipstacking

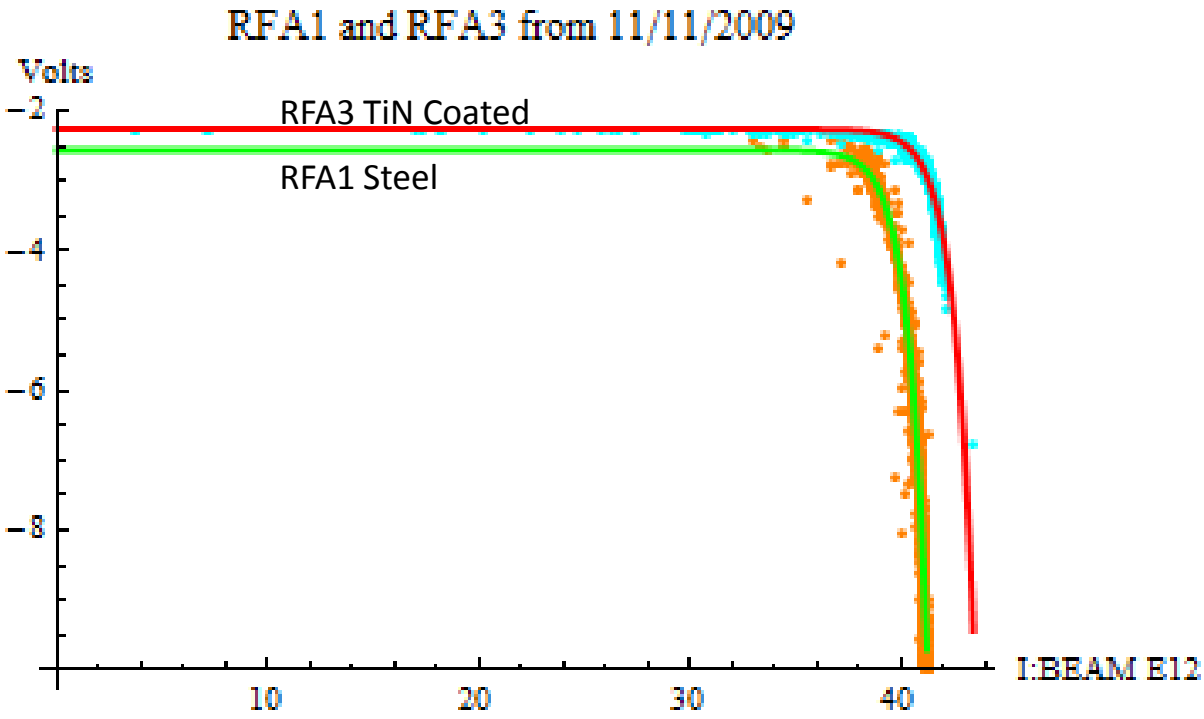






Note: The beam pipe seems to have conditioned more rapidly this run. This is due to higher initial intensities in MI.

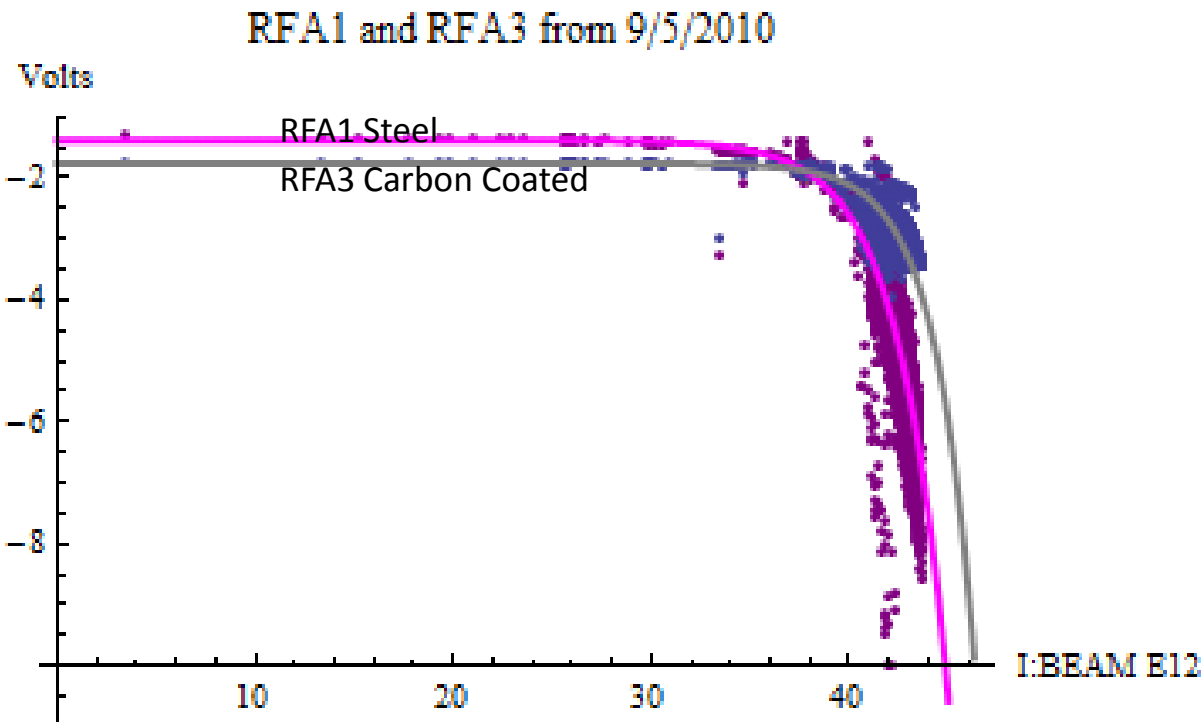
Comparison of RFA1 and RFA3 in 2009 to current data



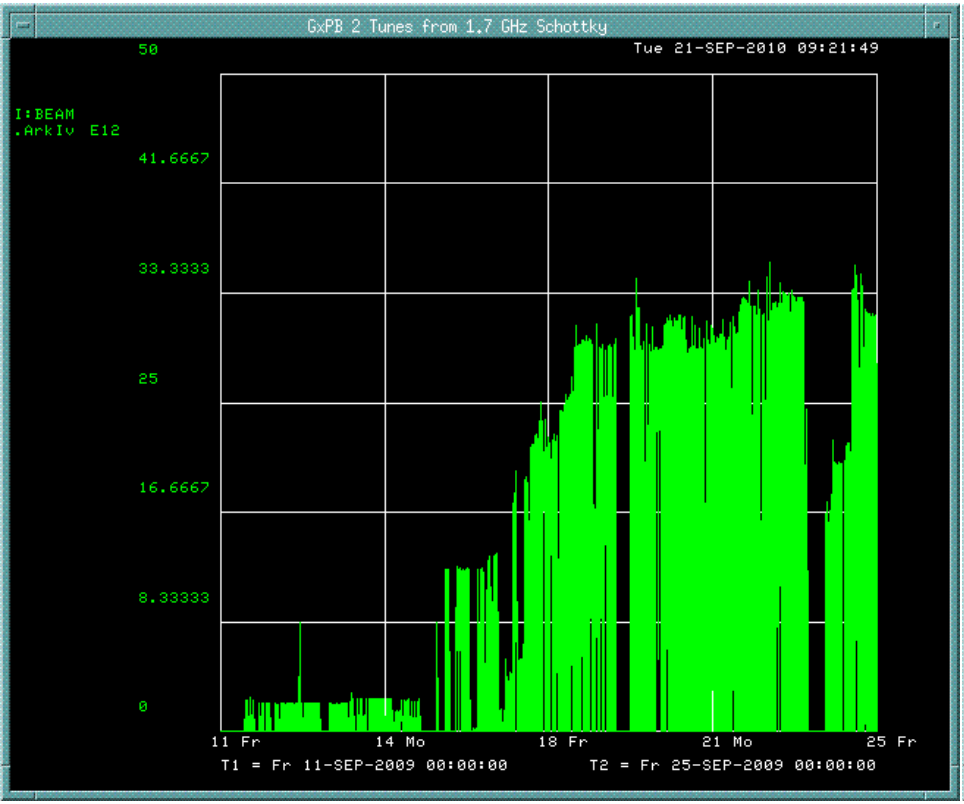
The top plot was after 29 days of conditioning

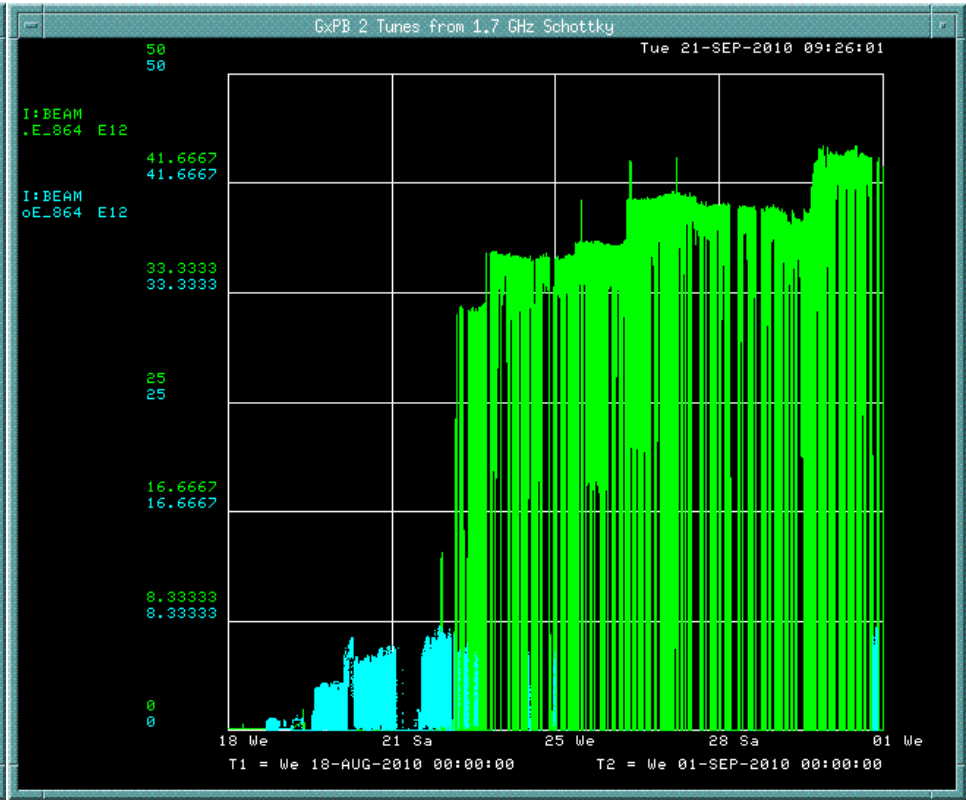
The bottom plot was after 14 days Of conditioning

Thus it took about twice as long to reach the same level of conditioning last year.



First 15 days of I:BEAM from 2009 on left and 2010 on right



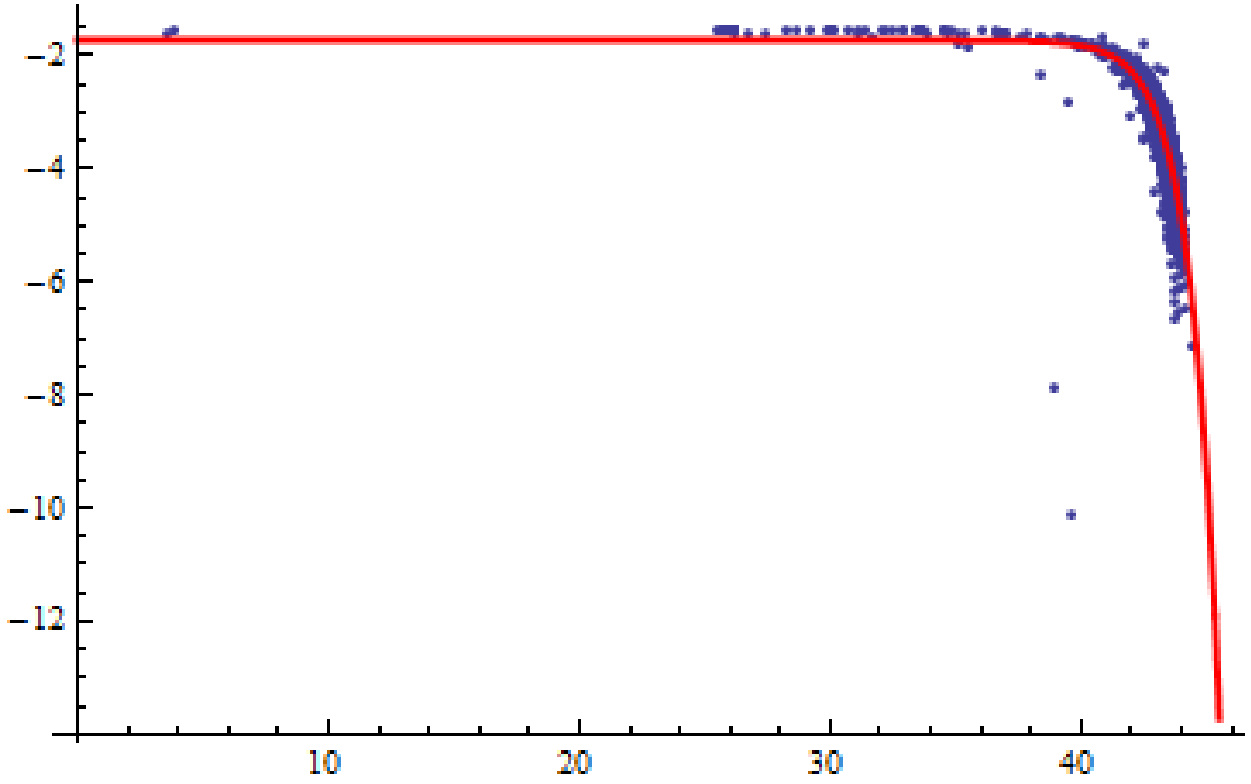


Signal=z-e^(a*(x-X0))

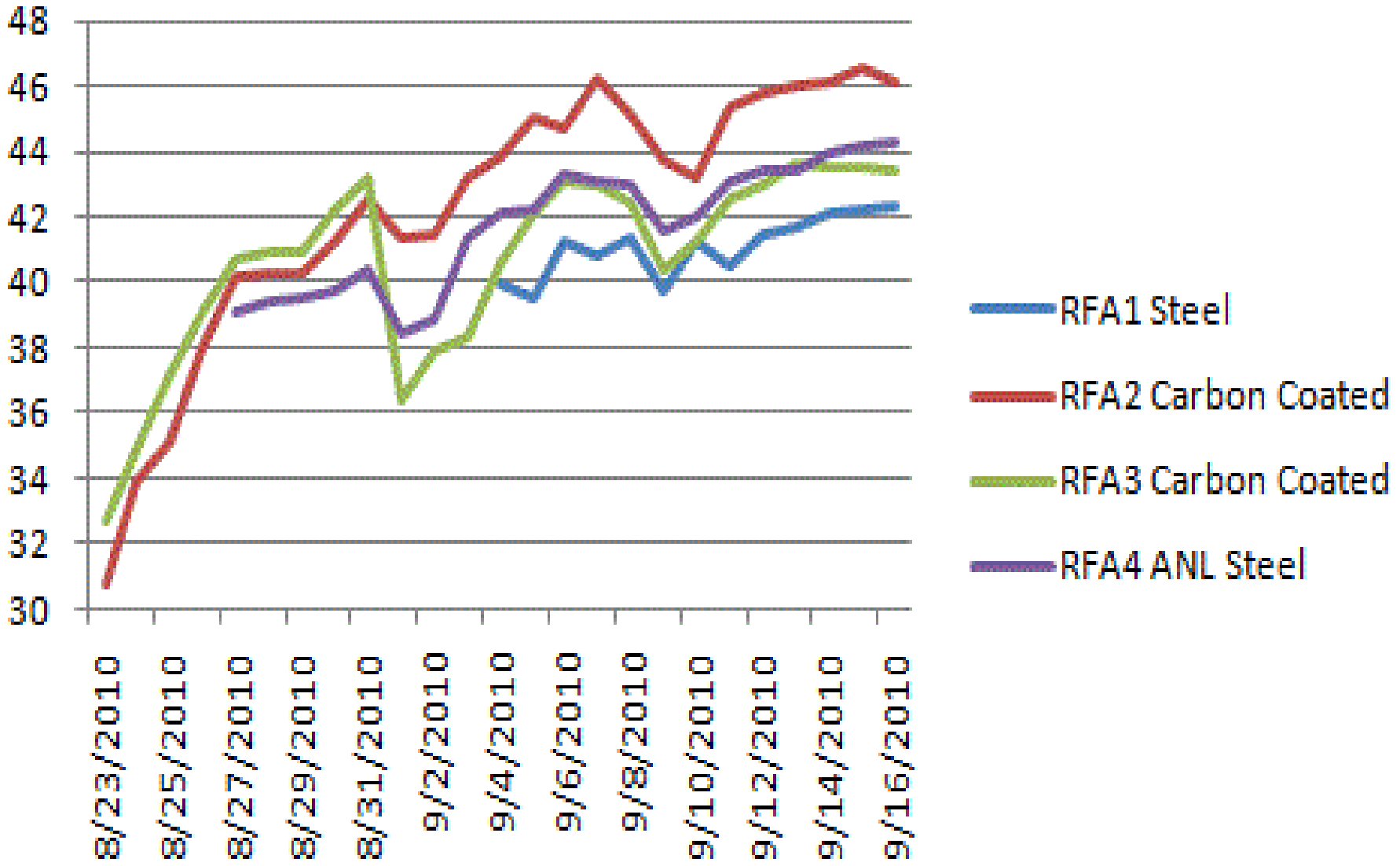
x is the beam intensity

When x=X0 the signal equals z-1

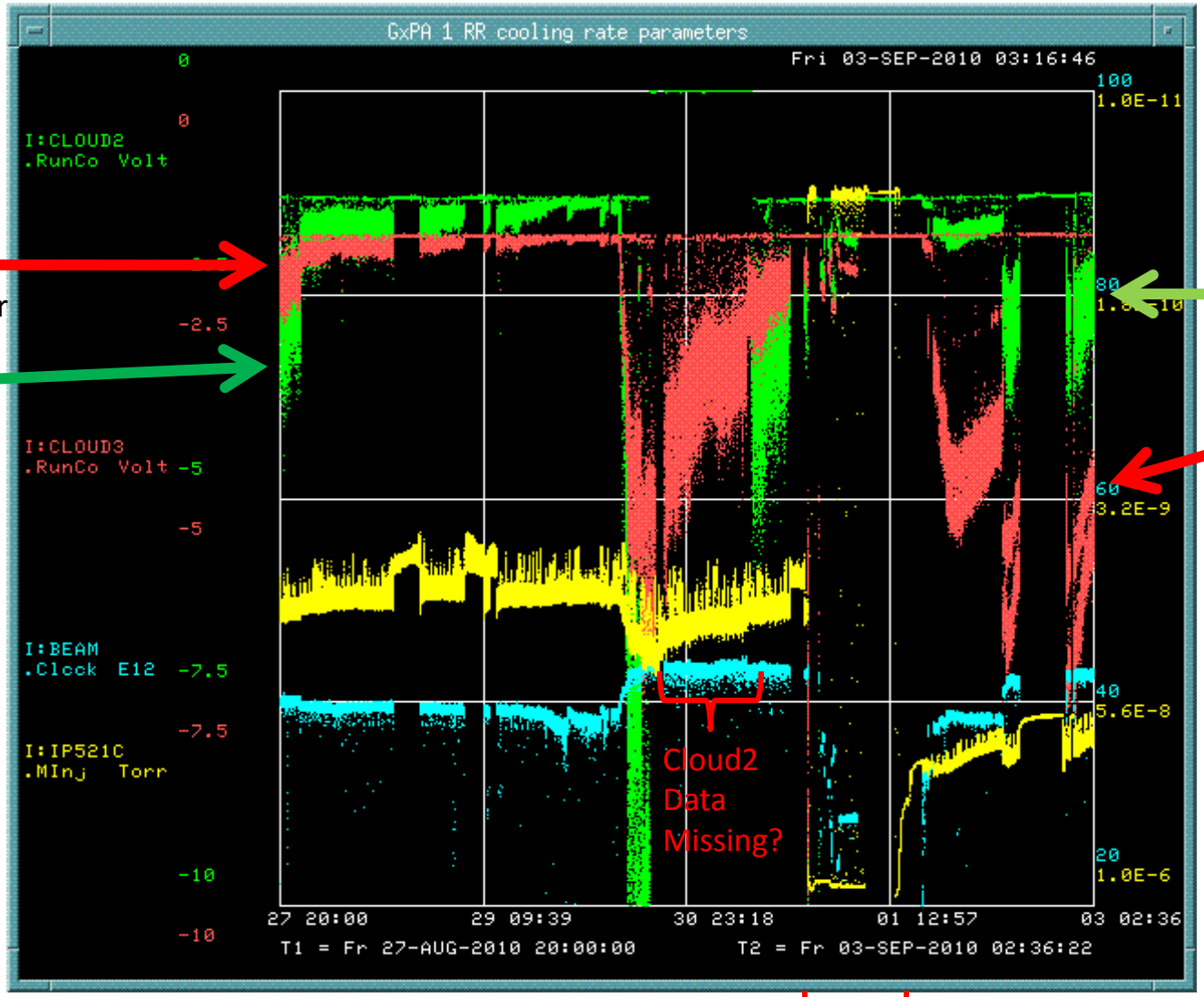
Thus by tracking X0 we can track the conditioning of the beam pipe over time



Time Evolution of X0 Value



Before the leak I:CLOUD3 signal is smaller than I:CLOUD2……After leak this is opposite



CLOUD3
Starts smaller than
CLOUD2

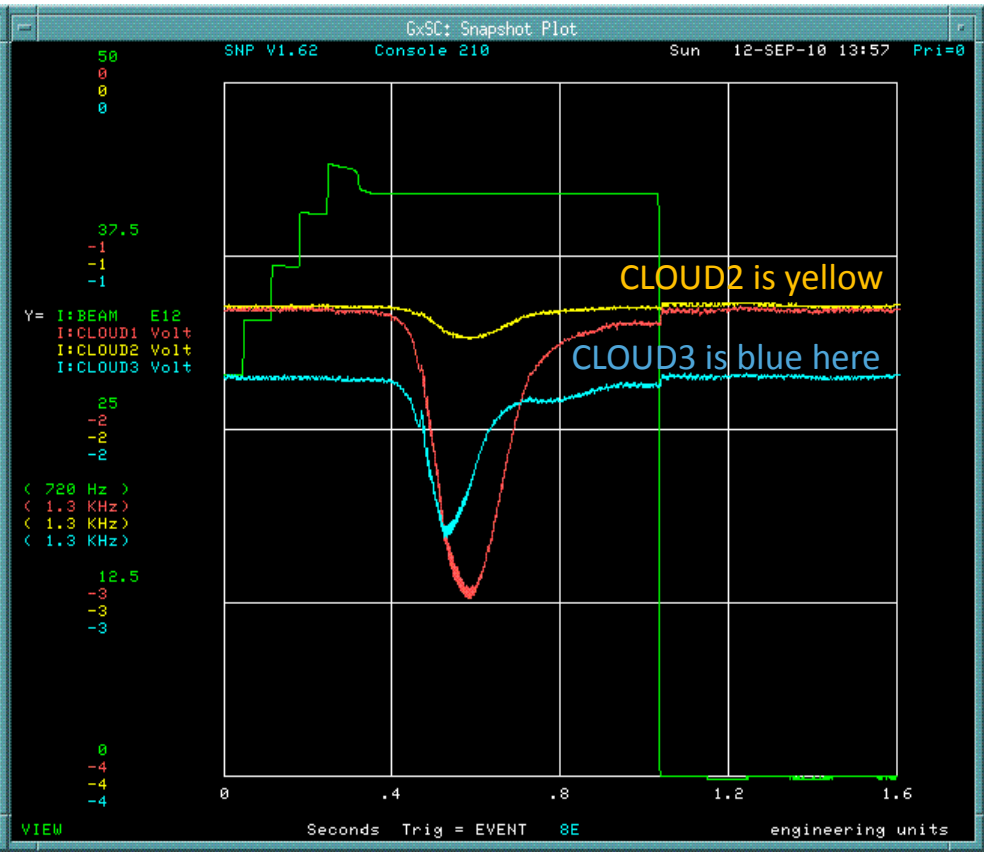
ClOUD2
now smaller than
CLOUD3

Vacuum Leak (Please note that I plotted IP521 from 1E-6 to 1E-11)

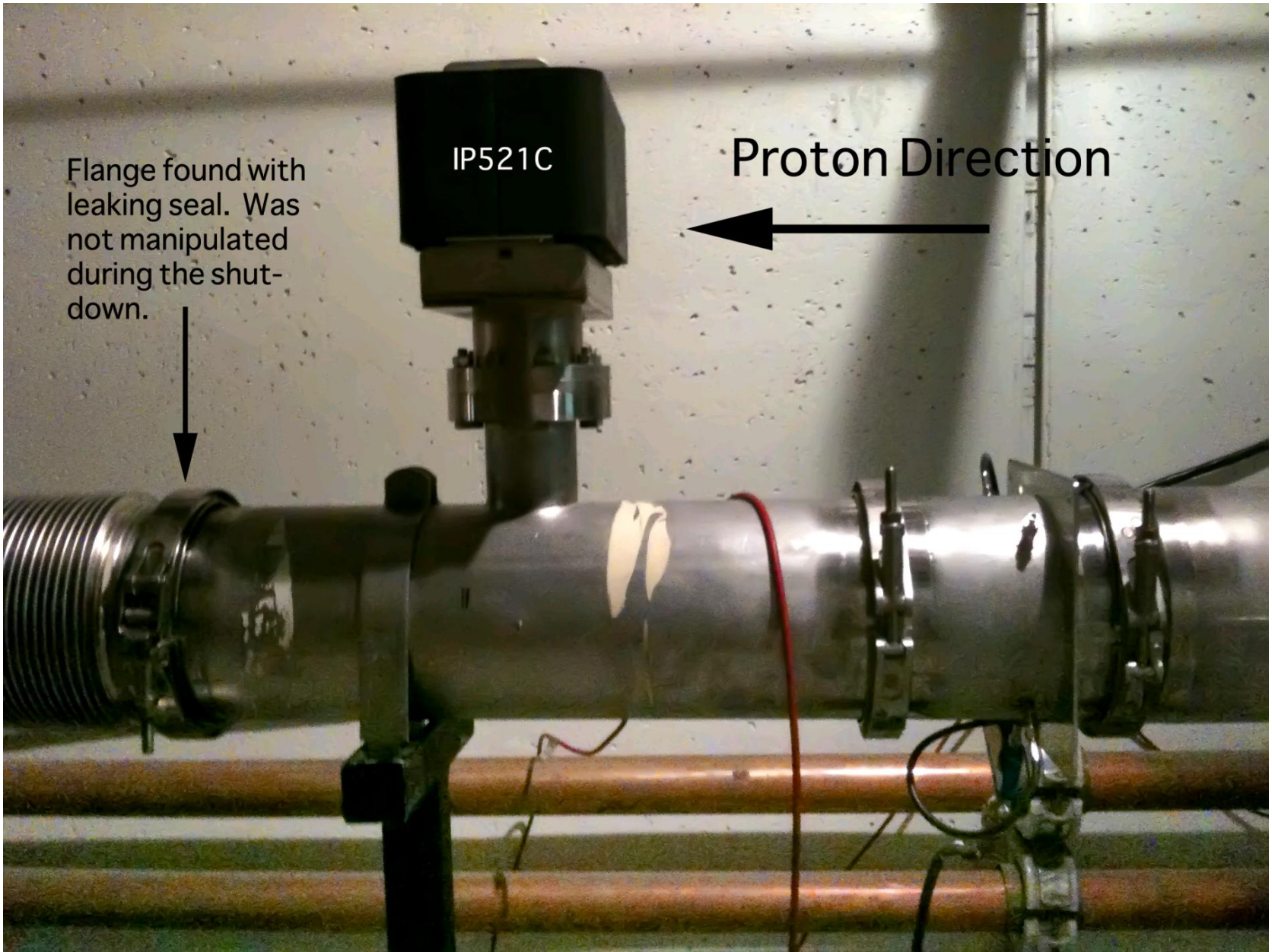
Vacuum Leak Results

Before Vacuum Leak
CLOUD2 is bigger than CLOUD3

After Vacuum Leak
CLOUD3 is bigger than CLOUD2

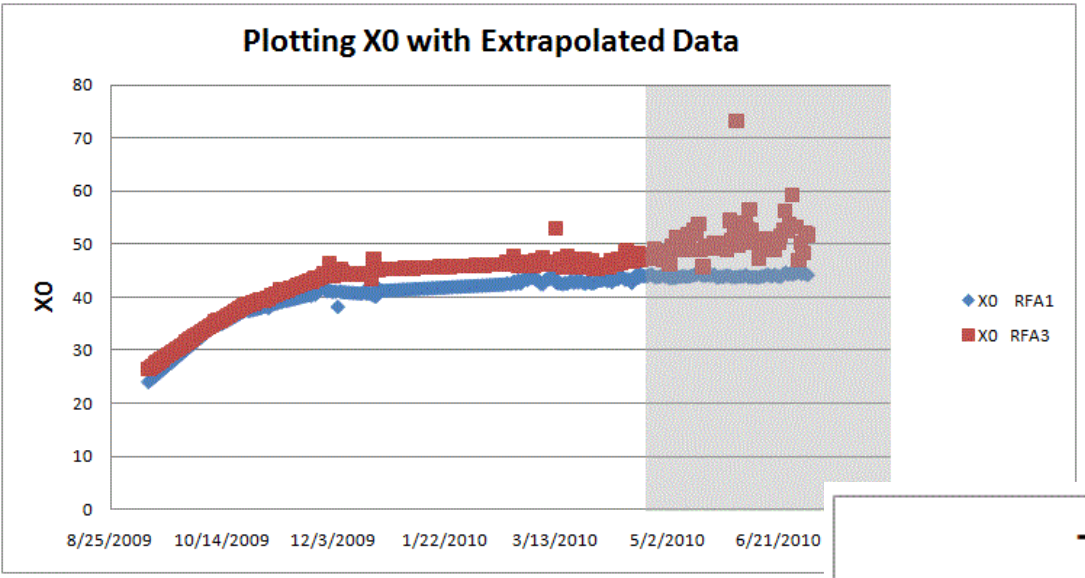


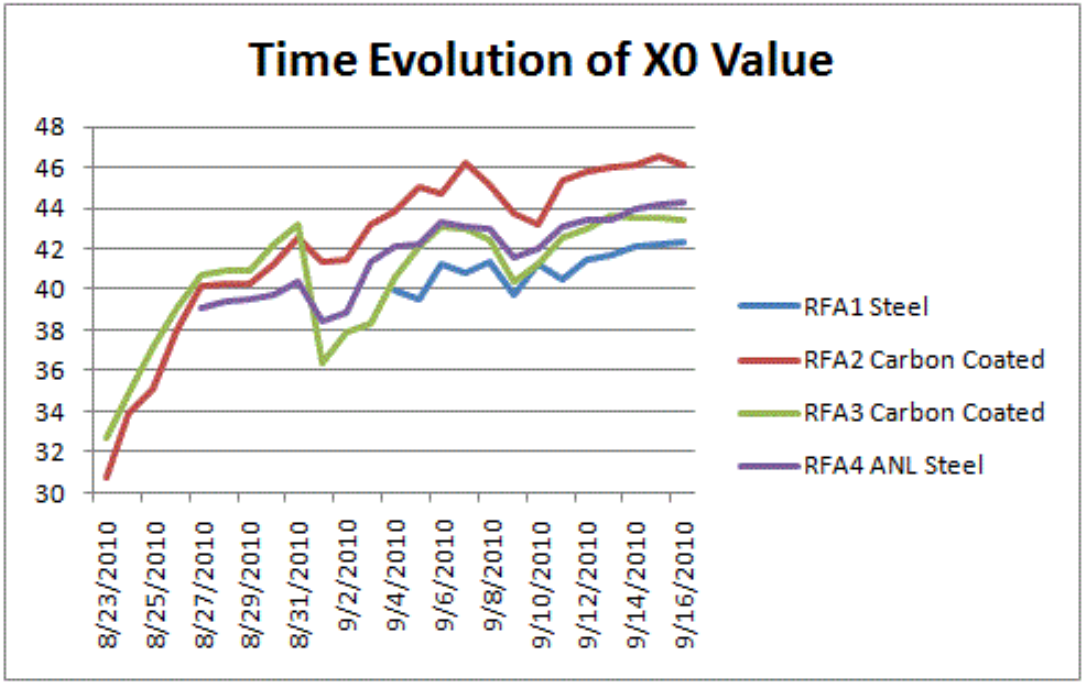
MI Leak at IP521




IP521
RFA3

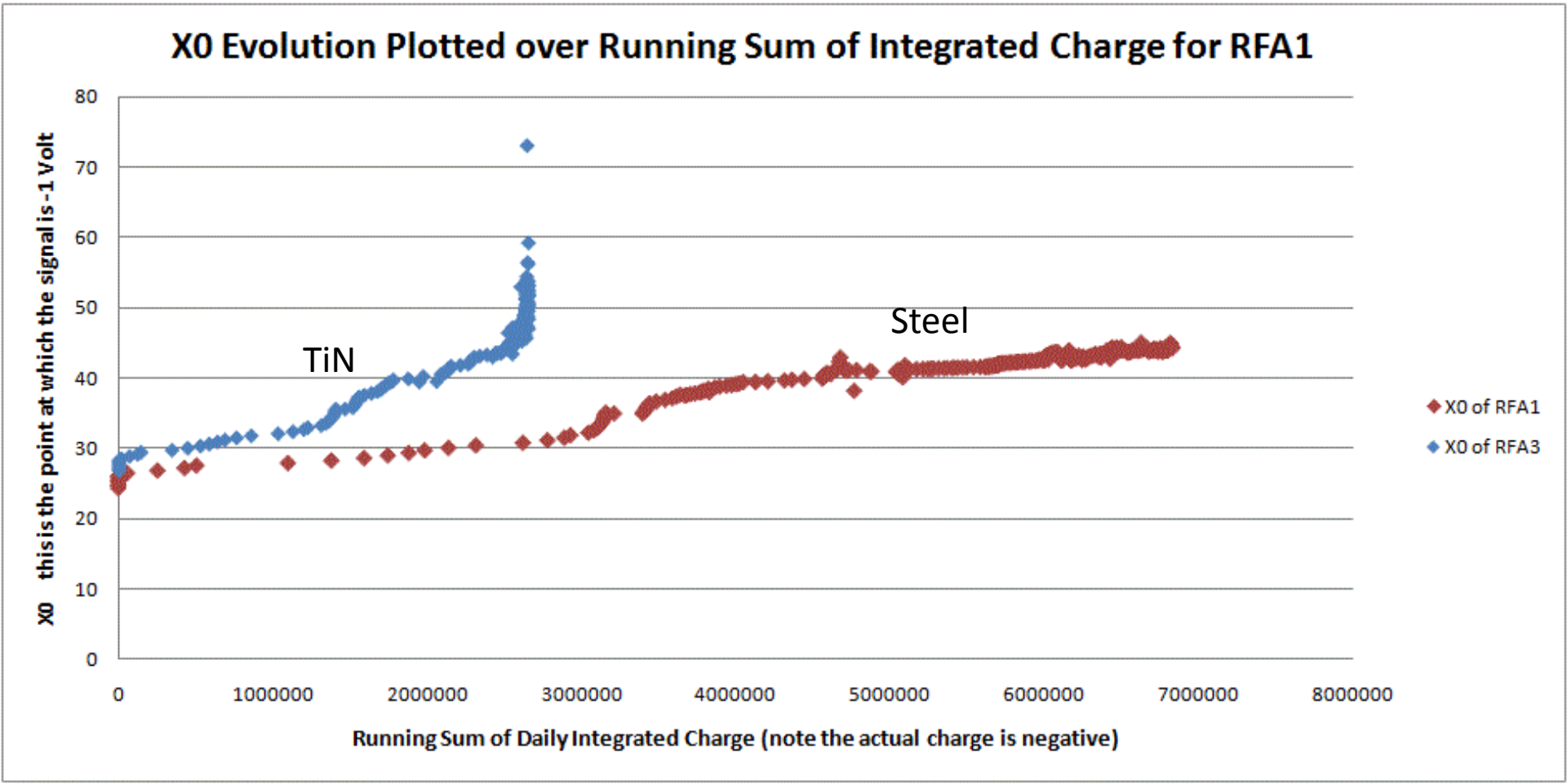
Left Plot is TiN vs Steel from first run
Right Plot is Current Data





RFA1 is Steel and RFA3 is TiN from Sept 2009 to July 2010

Note: As the TiN signal becomes smaller and smaller, the error in our fit gets larger.
This accounts for the hockey stick shape.
We integrate very little charge as the signal goes away.
The signal was barely visible by July 4 when we reduced intensities.



RFA3 Energy spectrum at .580 seconds from $8E and 40e12 on I:BEAM